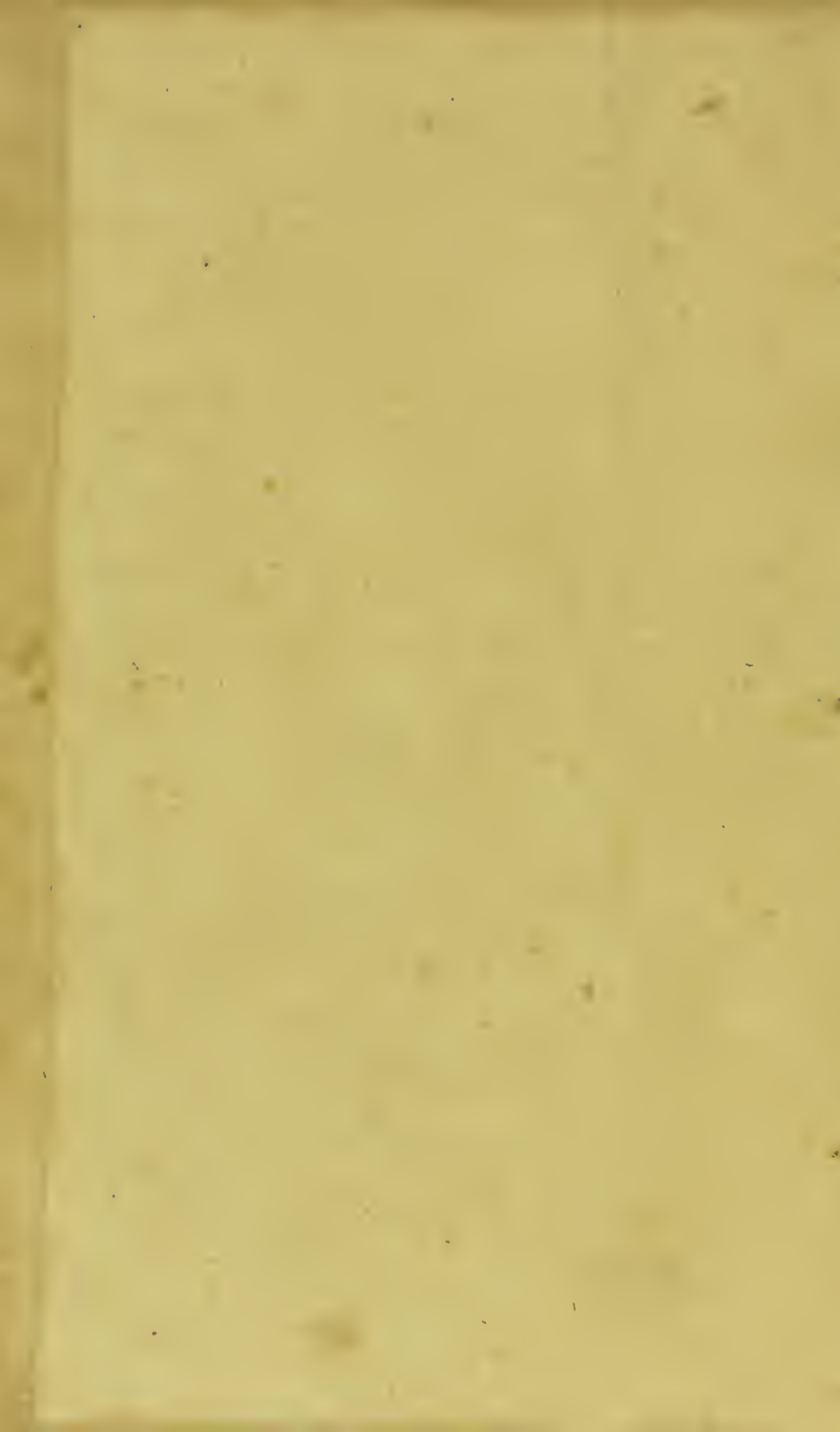






A
T R E A T I S E
ON THE
STRUCTURE, ECONOMY,
AND
D I S E A S E S
OF THE
L I V E R ;
TOGETHER WITH
AN INQUIRY INTO THE PROPERTIES
AND
COMPONENT PARTS
OF THE
BILE AND BILIARY CONCRETIONS.

B Y
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And Fellow of the Royal College of Physicians.

THIRD EDITION.
With Additions and Improvements.

London:
PRINTED AND SOLD BY W. PHILLIPS,
GEORGE YARD, LOMBARD STREET.

1803.



TO
SIR GEORGE BAKER, BARONET,
PHYSICIAN TO THE KING,
AND TO
THE QUEEN;
FELLOW OF THE ROYAL COLLEGES OF PHYSICIANS
OF LONDON AND EDINBURGH;

Of the Royal Academy of Medicine at MADRID,

F.R.S. and S.A.

DEAR SIR,

PERMIT me to present to you the following work, presuming that as the two former editions have been well received by the Public, this will be less unworthy of your notice than when before addressed to you as President of the Royal College of Physicians; this station, in itself respectable, has derived a considerable accession of dignity and importance from your talents and learning, and your retiring from it, has been the occasion of

DEDICATION.

deep regret to many, but to none more than myself, who must ever retain a grateful remembrance of your friendship.

I am proud to acknowledge that to you, I owe the situation which I hold in the College, and which gave me an opportunity of delivering the principal part of what is contained in the following pages, in the form of a Gullstonian Lecture.

That you may continue to live the patron of science, and enjoy the respect which is due to your distinguished character, is,

Dear Sir,

The sincere wish of

Your obliged and humble servant,

WILLIAM SAUNDERS.

LONDON, Dec. 20,

1802.

P R E F A C E.

THE two former editions of the following sheets have met with a sale which far exceeded the Author's expectations. The respectful notice which has been taken of the work, by Gentlemen of the first rank in the profession, and whose approba-

tion and esteem he must ever be proud to acknowledge, together with the favourable manner in which it has been received in the various critical periodical publications, have induced him to extend his inquiries and observations upon the subject still farther, and to prepare a third edition for the press.

THE attention which his book has excited, has been the occasion of his being frequently consulted, and of bringing many cases under his review, which have enabled him to extend his

practical observations, and to observe the variety of symptoms which occur in the different stages of those diseases in which the liver is the organ chiefly affected.

INDEED, so general is the influence of the different functions of this viscus, that any derangement of them may be expected to have a considerable effect on various other organs. Probably many complaints, which the patient is ready to refer to the organs of respiration, or to the stomach, or other parts of the

alimentary canal, may have their source in a morbid state of this organ.

THE accumulation of bile in the liver and gall-bladder, producing a turgescient state of that organ, and perhaps occasioning a congestion in the large blood-vessels of the abdomen, may be the frequent cause of that species of apoplexy which is best cured by purgatives, and such other means as promote the evacuation of bile. It is probable likewise, that the good effects perceived from the operation of

active purgatives in the early stages of acute diseases, and the advantages arising from spontaneous or even artificial diarrhœa in the more advanced stages of them, chiefly depend on the hepatic system (so frequently the seat of dangerous fevers) being kept pervious. It is also probable, that some affections of the mind may be intimately connected with such a state of the liver.

THE Author, not only by his own observation, but also by the correspondence which he has

had with Gentlemen of the profession in India, where Hepatitis is extremely frequent, is more fully confirmed in the propriety of the treatment he has recommended in the first stage of that disease. He must still, therefore, consider the antiphlogistic practice, there specified, as the most likely to succeed; and with all his partiality for the use of mercury, even before the inflammatory symptoms have subsided, he thinks that an early application of it, if not accompanied by the lancet, may have

disagreeable effects, from which he concludes that there is something very peculiar in the inflammation of the liver, perhaps depending on its structure.

THAT he possesses no prejudices against this important article of the *Materia Medica*, will clearly appear, when the reader discovers the attention he has paid to the different modes of exhibiting it in some diseases arising from an affection of this organ. In a state of the liver approaching to scirrhus, he considers it as the only medicine to

be depended upon, and more than this, in other diseases, such as diarrhœa and dysentery, which he considers as being frequently accompanied by such a state of this organ, he has experienced considerable advantage from the use of mercury.

BEING consulted by many patients labouring under ascites, and other species of dropfy, he has frequently been able to trace the source of these diseases to some morbid state of the liver. The Author has, therefore, in the later editions of this work,

given some explanation of the general pathology of dropſy; more eſpecially, however, as depending on the reſiſtance to the tranſmiſſion of blood through the venous ſyſtem of the liver: he has likewiſe extended his inquiries on the ſubject of diet, and the probable influence of the hepatic ſyſtem on the proceſs of digeſtion.

HE cannot conclude this Preface without acknowledging the obligations he has to Dr. Haighton, Lecturer on Phyſiology and Midwifery at Guy's

Hospital, for the ingenuity and accuracy with which he has planned and executed the various experiments made on brute animals, for the purpose of explaining and corroborating the doctrines advanced in this Treatise.

Dec. 12, 1802.

DURING a short residence at Cheltenham, this summer, the Author was consulted by many invalids; and had an opportunity of conversing with others who were under the use of the purgative saline waters of that place.

He soon perceived that they were very indiscriminately used in a variety of opposite diseases; and that their effects were such as might have been expected from so injudicious an application of their medical powers. The cases in which they appear to be useful, are evidently connected with a turgescence and congestion of the hepatic system in full and oppressed habits; where the secretion of bile is inconsiderable, and where the habit is costive.

THEY are of more use in fan-

guineous constitutions, than in pallid and chlorotic habits.

IN diseases of simple dyspepsia, with flatulency and acidity, and in cases of indurated and scirrhus livers, he has not perceived any useful operation from them.

THEY are chiefly useful when their purgative operation is such, as to relieve from a sense of distension immediately consequent on their being taken into the stomach: they lose their effect by daily repetition, and ought frequently to be alternated with

other purgatives, or aided in their operation by other means. In very delicate exsanguine chlorotic habits, he found the purgative plan universally improper; and in such cases recommended a chalybeate spring lately discovered at Cheltenham, from which the greatest advantage was derived. He met with many persons who had returned from the East and West Indies, with very torpid bowels, and diminished secretion of bile; in such cases, the purgative water was useful, and may be proper as preparatory

to the future use of a more tonic plan of treatment.

THE daily exercise and general habits of temperance, practised at Cheltenham, contribute not a little to promote the recovery of such invalids.

IN irritable and feverish habits, with thirst and general languor, evidently arising from some local and visceral affection, the waters of Cheltenham are less calculated to do good. In cases of jaundice, from some resistance to a free discharge of bile, and a sense of heat, distension, and fullness,

increased soon after eating, the Cheltenham water is useful. In cases of jaundice from gall-stones also, it is useful, but should be drank warm.

IN calculating the number of persons, and the variety of disorders among the invalids at Cheltenham, he thinks he may fairly conclude, that one-third of the whole was benefited,—one-third derived no advantage,—and another third was evidently hurt by persevering in the purging plan. Among the last cases, symptoms of languor,

flatulency, thirst, and debilitated digestion, were induced, or much increased.

How far the newly discovered chalybeate water may be employed to lessen or remove these inconveniences,--and under what circumstances it may be safely and beneficially had recourse to for that purpose,—is a subject which has already occupied a good deal of his attention; but it is one of too much extent, and requiring too minute a reference to individual cases, to be attempted here.

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CHAP. I.

ANATOMICAL DESCRIPTION

OF THE

LIVER.

SECT. I.

TO the secretion of the bile Nature has destined an organ of considerable size, called the Liver; its magnitude is greater than that of any gland in the body, so that it occupies a large portion of the abdominal cavity.

2. Its shape is so irregular, as not to admit of comparison with any mathe-

matical figure ; it is unlike any body with which we are acquainted. This circumstance of the liver is perhaps less essential than many others, as figure does not appear to throw any light on its economy. At least we naturally incline to this opinion, from taking a view of this viscus in different animals, when it appears that the external figure of the liver is determined by the figure of the animal itself, or of that particular cavity in which it is contained. In the human subject it is somewhat flattish and convex on its anterior surface, irregular on its posterior, having several depressions ; at its inferior edge there is a fissure extending some way up, particularly on its posterior surface, which

forms a division of it into two lobes of unequal sizes. These, from their situation in the abdominal cavity, are distinguished by the names of right and left, of which the right is the larger. Beside these, there is a smaller lobe, situated at the superior and posterior part, called *Lobulus Spigelii*.

3. THOUGH in adult subjects the right lobe is larger than the left, in the foetus the left is as large as the right. This variety depends on the disposition of the umbilical vein in the foetus with respect to this organ ; for on its arrival at that gland it sends off several branches, some of which, penetrating the left lobe, are of considerable size ; but after birth, when the circulation takes a new course,

the whole liver, but more especially the left lobe, diminishes in bulk.

4. BESIDE this variety in the proportion of its lobes, the whole foetal liver must necessarily exceed that of the adult in proportion; for, in addition to the vessels proper to the liver and necessary to its economy, there is one peculiar to the foetus, viz. the umbilical vein. This vessel, which has its origin in the placenta, accompanies the other vessels of the cord, and perforates the navel; thence, having reached the inferior edge of the liver, it passes along the fissure which separates the lobes, and, having entered its substance, sends off several branches; those going to the left lobe are larger and more in number than

those to the right. The umbilical vein afterwards divides into two branches, one, called *canalis venosus*, taking the course of the *vena cava*; the other, uniting with the branch of the *vena portarum*, pours its blood into that system; so that by much the largest proportion of the blood circulating between the foetus and placenta, passes through the liver, and this sufficiently explains why the foetal liver exceeds in proportion that of the adult.

5. THIS organ is situated in the superior part of the abdomen, principally on the right side; occupies the epigastric and the right hypochondric regions, and sometimes extends into the left hypochondre. Its precise situation cannot

be easily determined, as the inferior part of the chest admits of considerable variety both in its figure and capacity. In males, where there is a greater capacity of chest, the hypochondres are more capacious; hence the epigastric and the right hypochondric regions are large enough to contain this viscus.

6. IN females, who have naturally a smaller chest, which is often still more contracted by tight lacing, the epigastric and the right hypochondric regions are insufficient to contain the liver, it therefore extends far into the left hypochondre; beside which, it sometimes, in these cases, occupies no inconsiderable part of the umbilical region. Its situation, then, with respect to the general

cavity of the abdomen, admits of some variety. In the fœtus, it occupies the whole epigastric region, and both the hypochondres; not so much from any peculiarity in the figure of the upper part of the abdomen, as from a difference in the proportion of the right and left lobe, which has already been noticed.

7. THOUGH the situation and extent of the liver in the general cavity of the abdomen, admit of some variety, yet its position with respect to the diaphragm is rather precise, being connected to it by doublings of the peritonæum, called ligaments.

8. THIS viscus, in common with the others of this cavity, receives a covering

from the peritonæum, which, doubling upon itself, and quitting the liver, is attached to the diaphragm. This connection obtaining in certain parts, forms the ligaments. The most conspicuous of these, is that which is situated on its anterior part, in a line corresponding to the fissure, forming the distinction between the right and left lobe; and which, extending from the superior to the inferior edge, is called by some, from its resemblance to a scythe, the *FALCIFORM* ligament; by others, from its function, the *SUSPENSORY* ligament.

9. THE lateral portions of the liver are connected in like manner to the corresponding parts of the diaphragm, taking the name of lateral ligaments.

Beside which, some anatomists reckon the portion of peritonæum furrounding the vessels which pass from this viscus through the diaphragm, as a fourth ligament, and call it the CORONARY ligament.

By these different reflections of the peritonæum, the liver is supported in its situation.

10. But there is yet another part, usually numbered with the ligaments, which, however, performs no ligamentary function, viz. the ligamentum rotundum.* This passes from the concave

* The ligamentum rotundum has already been noticed under the name of umbilical vein, of which it is to be considered as the collapsed remains: for after the circulation through it has ceased, which necessarily happens at birth, its cavity diminishes, and in time becomes nearly obliterated.

part of the liver along its longitudinal fissure, and is continued to the umbilicus.

11. HENCE in the living subject, the situation of the liver must vary with respect to the general cavity, accordingly as the diaphragm descends or ascends, in the acts of inspiration or expiration.

12. THE situation of the stomach with respect to this organ is such, that the right portion of the former is frequently covered by the left lobe of the latter, and, from the bilious tinge frequently found on the external surface of the duodenum near the pylorus, it appears that the gall-bladder usually rests on this part.

13. THE gall-bladder is a bag some-

what pyriform in its shape, its neck or small extremity being situated superiorly, and its fundus, or large extremity, inferiorly. It is lodged in a depression on the concave surface of the right lobe of the liver, to which it is attached by a continuation of the peritonæal coat of that viscus over its surface. It varies somewhat in size according to the degree of distention which it suffers, but, in most instances, the fundus projects a small distance below the inferior edge of the liver. Being intended by nature to contain bile, it has a duct by which it receives a supply of that fluid; but with this peculiarity, that the same duct is likewise the only outlet through which the bile can pass into the intes-

tines : a circumstance in the œconomy of this part, which we shall have occasion to consider more particularly hereafter.

C H A P. II.

VESSELS OF THE LIVER.

S E C T. I.

EVERY organ destined by Nature to secrete a fluid, is very plentifully furnished with blood. The necessity of this is evident; for it requires, not only a supply of that fluid for the purpose of its nourishment, but an additional quantity also, to enable it to perform its secretory functions; as it is

from the blood that all the secretions are derived.

SUCH is the œconomy of Nature in glandular bodies in general, that the same fluid which is fit for the nourishment of the gland, is adapted also to its secretory office, and is conveyed to the organ by the same vessel. But the physiologist is unable to ascertain, with any degree of precision, how much blood is allotted to nutrition, and how much to secretion.

2. OUR knowledge of the economy of Nature in this respect, receives some light from a peculiarity which obtains in the liver, and which distinguishes it in a very striking manner from all the other glands of the body. For, while in them the functions of nutrition and

secretion are combined in the same vessel, in this, these offices are kept apart, and performed by different vessels. Therefore, by a careful comparison of the area of the nutrient with that of the secreting vessel, we may readily allot to each its due proportion.—But this idea will be farther pursued hereafter.

3. BLOOD of every description is not equally fit for nutrition: that only, which has received the change from respiration, and which circulates through the arteries, is well adapted to this purpose; therefore the liver receives its nutrimental blood from an artery.

4. THE rule by which Nature seems to be guided in the origin of vessels supplying other organs, obtains equally

in this, as the hepatic artery arises from the nearest considerable trunk.—The following is the mode of its origin :

5. THE Aorta, while it is passing between the crura of the diaphragm, sends off, from its anterior part, three considerable azygous trunks: the first takes the name of cœliac artery; the second, which is almost immediately under the former, is called the superior mesenteric; and the third, which goes off from the aorta at some distance from the last vessel, is named the inferior mesenteric artery: the two last supply the intestinal canal.

6. THE cœliac trunk soon divides into three branches:—the first, from its being distributed to the lesser curvature

of the stomach, is termed the coronary artery ; the second, passing to the spleen, is called the splenic artery ; and the third, or largest, whose office we are now to consider, takes the name of the hepatic artery.

7. THE hepatic artery, at its origin, is a vessel of considerable size, but before it arrives at the liver is sensibly smaller ; the cause of which is, that in its progress it supplies adjacent parts with blood, viz. the right portion of the stomach, by means of the gastrica dextra and pylorica, and the gall bladder by the arteria cystica ; therefore, in forming a true estimate of the quantity of blood sent to the liver for its nourishment, we are to consider the area of the hepatic

artery, after the three preceding branches are sent off.

8. **THIS** vessel, agreeable to the general law of distribution, divides into branches before it enters the substance of the liver ; its ramifications then multiply and extend with great minuteness through the whole mass ; so that in every part of its substance there is circulating blood possessed of properties fit for nutrition. But as this blood is in a state of constant motion, and is continually displaced by successive fresh supplies, a redundancy is prevented here, as well as in the other parts of the body, by returning veins. The ultimate branches then of the hepatic artery terminate in the hepatic veins, and

these return the blood into the vena cava inferior, by three or four venous trunks. Such is the circulation through the liver as connected with its nourishment. We are next to consider it as an organ of secretion.

9. THIS organ differs from every other gland of the body with regard to the nature of the blood from which secretion is performed. While other fluids are secreted from florid arterial blood, which has lately received changes from the air by the intervention of the lungs, the bile is formed from blood of a dark colour, possessing the common characters of venous blood, and is conveyed to the liver by a vein.

10. THE vena portarum, which con-

veys this blood, takes its name from the part of the liver at which it enters; there being two eminences, one on each side of the fissure, called the portæ, where this vessel begins to penetrate. To understand the origin of the vena portarum, and the properties of the blood which it conveys, it will be necessary to explain the circulation through the chylopoietic organs. The branches of the cœliac and mesenteric arteries, as we have before observed, distribute their contents to the stomach, intestines, pancreas, and spleen, besides the hepatic artery, which supplies the liver. The blood circulating through all these viscera, except the last, being returned by their respective veins, is poured into their common

trunk, the vena portarum: thus the origin of the vena portarum, appears to consist in the concurrence of all the veins of the peritonæal viscera, except the liver.

II. As the function of this vein differs from that of other organs, it has been supposed to possess some peculiarities of structure.—Some have thought it more muscular than other veins, and that its characters approach nearer to those of an artery. It certainly does not possess the grand discriminating mark of an artery, or the power of preserving its orifice circular, when divided transversely. If it differs from veins in general, it is in having thicker tunics in proportion to the capacity of its

canal ; but with respect to the arrangement and disposition of its muscular fibres, this part of its structure does not appear sufficiently defined, to authorize us to speak with precision.

12. GLISSON, whose opinion on this subject is not always quoted with approbation, conceived its grand characteristic to consist in a continuation of that duplicature of the peritonæum surrounding the vessels going to the liver, in the manner of a capsula, and to which it is usual to annex his name.

He conceived, likewise, that it not only envelopes the trunk of this vein, but accompanies it in all its ramifications through the liver ; so that if a section were made into this organ, the

branches of the vena portarum would be distinguished from those of other vessels by the presence of this adventitious tunic.

13. FOR this membrane, which the imagination had formed, fancy soon suggested a use—Mistaken observation had led him to believe that it possessed muscular properties, and that it propelled with force the blood, whose motion would otherwise have been languid. The investigations of other anatomists have not confirmed this opinion. They have disproved the continuation of this peritonæal capsula beyond the trunk of the vena portarum, and have demonstrated, that it does not envelop the vena portarum in a particular manner, but

only invests it in common with other vessels, and as soon as it has arrived at the liver it quits them altogether, and, by expanding itself over the substance of this gland, forms its tunic.

14. THE vena portarum having reached the liver at that part called the great fissure, forms one large trunk called the sinus of the vena portarum, from which three principal branches usually take their origin; these, by forming subordinate ramifications in a regular series, at length arrive at their terminations.

15. THE extremities of these vessels end in two ways: one with respect to the circulation of the blood; the other, as connected with their economy, as

secreting vessels. In the first point of view, they inosculate with branches of hepatic veins, and through that channel return to the inferior cava all that blood which is not employed in the business of secretion. So that the hepatic veins are the common recipients of the contents of the hepatic artery, and likewise those of the vena portarum.

16. THE secreting termination of this vein is in the beginnings of the hepatic ducts, called *pori biliarii*; which in their origin must necessarily be very minute, inasmuch as they preclude admission of the red particles of the blood: from these minute beginnings they gradually enlarge by an union of branches, until at length they pass out

from the liver at its fissure, by two or three trunks, which soon after join together, and form the trunk of the hepatic duct.

17. THE structure of this vessel is apparently membranous, having no fibres which can be considered as muscular, at least as far as we can decide by ocular demonstration. But, as the eye, even when aided by glasses, is not always competent to detect muscularity, we are compelled to have recourse to another and less fallacious test, which is—the power of contraction on the application of a stimulus. Mechanical and chymical stimuli have been applied to this duct in a living animal, without producing any contraction which can

be referred to muscularity. Some chymical stimuli, it is true, will corrugate this canal; but they are such as produce effects only by corrosion, and which they do as readily on inanimate as on living matter.

18. ANOTHER argument against their muscularity is, that canals obviously muscular, readily adapt their capacity to their contents. This law is very evident in the vascular system. But when a biliary duct has been dilated by the passage of a gall stone, it does not very soon return to its primitive dimensions. And, perhaps, those painful affections of these parts, which have been very commonly considered spas-

modic, may find a more adequate explanation in the passage of a calculus.

19. If the internal surface of this system of vessels be examined, it will be found moderately vascular, as there is an appearance of follicles in many parts ; hence it is probable, that it secretes a mucous kind of fluid.

20. BESIDE the vessels already described, the liver is very plentifully supplied with absorbents, which take their origin from every part of its substance, but more especially from the branches of the hepatic duct. The proof of this origin will be reserved until we treat of the economy of this organ. From the interior part, the absorbents pursue the direction of the surface, some

ramifying on the anterior and some on the posterior surface: their disposition while on these parts is arboreſcent. Thoſe on the convex ſurface incline towards the direction of the falciſorm ligament, along which they paſs, and extending their courſe in the direction of the diaphragm, terminate in the thoracic duct near to that part. Thoſe which ramify on the concave ſurface, form, by a ſeries of junctions, a common trunk, which, paſſing from the liver in the direction of the hepatic artery, and with it and the other veſſels being incloſed in Gliffon's capſula, terminate in the thoracic duct near the receptaculum chyli.

21. THESE two ſets of abſorbents,

while ramifying within the liver, have a free communication with each other, as may be proved by injection with mercury. From a superficial absorbent on the convex surface, mercury will sometimes penetrate the substance, and thence pervade those on the concave side, from which the thoracic duct may be filled.

22. THESE vessels possess the same character while in this organ as they do in other parts of the body; that is to say, they are valvular. But notwithstanding this, they may be injected in a direction contrary to that in which their contents move. This, though apparently a paradox, is strictly consonant to reason and fact; for the function

of the valves here is less complete than in some other parts of this system, so that by pressure, mercury may take a retrograde course in the same vessel,— Another reason is, that as the lateral communicating vessels exceed the valves in number, a cluster of absorbents may be injected by a course in part retrograde, and in part circuitous. It is in this way an injection may be made to pass through the branches of the spermatic vein, in a direction contrary to the natural circulation; yet those vessels are plentifully furnished with valves.

23. BESIDE vessels, the liver is furnished with nerves, though not very plentifully. The par vagum and intercostal nerves, while in the cavity of the

thorax, communicate by branches with each other. Near to this part of junction, several branches are sent off, some of which are distributed to parts contiguous, others to more distant organs. But there is detached from each side, a branch more conspicuous than the others, viz. the splanchnic nerves, which, having pierced the diaphragm, unite.

24. AT the point of union, there is formed a ganglion, which, from its crescent-like figure, is called semilunar. From this ganglion there pass off, in various directions, a number of nervous filaments, which, intermixing and observing a radiated course, form the solar plexus. From this, several subordinate

plexuses are detached, which receive names from the parts they supply; hence the names of stomachic plexus, splenic plexus, &c.—But from its right portion, several small nervous filaments pass, which, surrounding the hepatic artery, accompany it to the liver, and take the name of hepatic plexus.

C H A P. III.

THE NATURE OF THE BLOOD
CIRCULATING THROUGH THE VENA
PORTARUM CONSIDERED.

S E C T. I.

HAVING given a general description of the vessels supplying the liver, we are led to examine into the nature of their contents. And here we may remark, that it is very desirable, but at the same time extremely difficult, to ascertain the peculiar characters of the

blood, after circulating through each of the chylopoietic viscera, previously to its passage into the liver by the vena portarum; and to determine, why it seems better adapted to the secretion of bile than common arterial blood, from which other secretions are supplied.

2. THAT venous blood is more favorable to this secretion than arterial, is very evident; and this exception of the liver to Nature's law in the economy of other glands, may be admitted as a proof of it. But the peculiar changes induced in the blood, after circulating through the arteries of the stomach, and yielding the gastric fluid; after penetrating the pancreas, and there affording pancreatic juice; after pervading the

intestines, where it not only give out the intestinal mucus, but from its vicinity to fæculent matter, may receive putrescent properties,—are at present, and may perhaps long continue, an ample field of speculation and conjecture.

3. THE power of the spleen in this respect, has been particularly acknowledged and insisted upon; infomuch that modern physiologists have considered this as its only function. That the spleen, in common with the other viscera, may contribute somewhat to change the properties of the circulating blood, ought not to be denied; but whether this be the principal and only

end of its function, cannot, I think, be too carefully investigated.

4. THE number and rank of those physiologists who have considered the spleen as an auxiliary organ to the liver, are too respectable to be opposed on any ground, except that of experiment, and induction.

When opinion is opposed to opinion, and no reasons adduced on either side in support of each, whatever difference there may happen to be in the credit or authority of their respective promulgators, the opinions themselves stand on equal ground. It is the reasons then which stamp the true value of any opinion, and to them only we shall direct our investigation.

5. FIRST, “ *The blood which has circulated through the spleen, and which is returned from that viscus by the splenic vein, is poured into the vena portarum.*”

6. THE position is unquestionably true, and merits consideration ; yet its proper influence on the mind, when considered as proof, ought to be duly weighed : for when we recollect, that this circumstance in the spleen is not a peculiarity in that organ, but one which obtains in every peritoneal *viscus* except the liver, it must be evident, that, as far as this argument alone has force, the position falls infinitely short of proof, and that the spleen administers to the office of the liver in proportion only to the quantity of blood returned

from it. This idea then, appears to owe its birth more to our ignorance of the real use of that organ, than to any force in the cause just assigned.

7. SECONDLY, “ *The blood in its course through the spleen, receives changes which enable it the better to concur with the liver in the secretion of bile.*”

The changes ascribed are, a greater degree of fluidity, and a putrescent tendency.

8. BARON HALLER was of opinion, that the blood returned by the epiploic and mesenteric veins, contained a large portion of adipose matter, which it received by the absorbent power of those veins, and which imparted to it so great a degree of viscosity, that without the

diluting power of the splenic blood, which mixes with it when entering the *vena portarum*, it would be liable to concrete.

9. THERE is little probability in this opinion, whether we consider the power of the epiploic veins to absorb fat from the *omentum*, or the function of the spleen to dilute the blood of the *vena portarum*.

Aborption by red veins has so few advocates in the present day, that it were superfluous to adduce either argument or experiment by way of refutation. But waving that controversy, let us inquire how far the spleen acting on its blood as a diluting organ, can be supported by facts.

EXPERIMENT.

10. THE *abdomen* of a living dog being opened, and the spleen with its vessels being drawn gently out, blood was taken both from the artery and the vein, and received into cups of similar shape and equal size. On weighing each, there was found to be 420 grains of arterial, and 468 of venous blood. Both coagulated in less than two minutes, and in about the usual time they separated into *serum* and *crassamentum*. In twenty-four hours the *serum* of both was accurately weighed: the 420 grains of blood from the splenic artery, separated 191 grains of *serum*; the 468

grains from the vein, separated 213 grains.

II. BUT our conceptions of this matter will be much assisted by instituting a comparison with one common standard, still preserving the *ratio*.

Therefore we say, 1000 parts of blood from the splenic artery, separated 454, while the same quantity from the vein yielded 455 : a difference so inconsiderable as this, surely can never be laid hold of as a proof, that the spleen is subservient to the liver on the principle of a diluting organ.

But to pursue the inquiry still further, I thought it of importance to examine the fluidity of the *serum*.

EXPERIMENT.

12. EQUAL portions of each *serum* were exposed to nearly the same degree of heat until coagulation had taken place. Upon pressing the surface of each, there exuded at different points small particles of a watery fluid, which Senac calls the ferosity of the blood; and, upon examining the proportions of each, I could not discover any difference. Therefore, if we admit that the liver receives any assistance from the spleen, it does not appear to owe any thing to that organ on the principle of dilution.

13. THE other change supposed to be induced in the blood by its circu-

lation through the spleen, is a putrescent tendency: this has been conjectured in part from its contiguity to the *colon*, and in part from the languid state of the circulation through that *viscus*.

Without instituting any serious inquiries into the probable weight of these reasons, and their sufficiency to support the proposition, let us inquire into the fact itself.

EXPERIMENT.

14. Two portions of blood, one taken from the splenic artery, the other from the vein, were exposed for four hours to a heat upwards of 90 degrees ;

but neither of them betrayed the smallest marks of putrescency.

This opinion appears to have originated in an erroneous idea concerning the properties of the bile, which some have considered as the most putrescent fluid of the body; but with extreme impropriety, as experiments have fully evinced.

15. THUS far our inquiries have favoured very little the idea of any peculiar connection between the spleen and the liver. But in order that the refutation may be more complete, it is necessary that a comparison be made between bile taken from an animal whose spleen has been previously removed, and one in which that *viscus* is still remaining.

EXPERIMENT.

16. THE spleen of a dog was removed, and the wound healed up in a few days. He was kept several weeks afterwards, during which time he ran about the house like any other dog. Another dog in perfect health being procured, both were strangled, and the bile contained in the gall bladder of each collected in separate vessels for the purpose of comparison.

17. THE colour of both, which was that of a bottle-green, corresponded very exactly.

There was no difference in tenacity :

in both it was just sufficient to prevent its falling from a phial in drops.

The taste of each was intensely bitter, and slightly pungent.

No perceivable difference in smell.

Portions of each being mixed with *litmus*, turmeric, and syrup of violets, betrayed no difference of colour.

Equal portions of each of these specimens of bile, being mixed with equal portions of concentrated vitriolic acid, a brown colour was produced; and with very diluted vitriolic acid, a straw colour.

With concentrated nitrous acid, both effervesced, and exhibited a brown colour.

With alkohol, there was a flocculent appearance. Evaporation to a thick extract, left a *residuum*, which was highly inflammable.

18. THE result of these experiments makes it highly probable, that the bile secreted after the loss of the spleen, differs in no respect from other bile; and that the liver in the exercise of its function, is perfectly independent on that viscus.

19. THUS we see, that an opinion which has received a degree of currency from the sanction of men of eminence, loses its importance, when examined by the test of experiment; and a patient investigation of Nature's ope-

ration, on this plan, must ever prevail over authority or prejudice.

20. IT has been proved above, that venous blood is the proper source of the biliary secretion. Several physiologists assert, that additional properties are imparted to it during its circulation through the peritonæal *viscera*: but neither experiment nor observation has afforded any thing conclusive in favour of such opinion.

21. THE peculiar economy of the biliary organ in the *fætus*, is particularly deserving our consideration, as the blood from which the secreted fluid is made, cannot be considered as strictly venous, but as partaking, in some measure, of the arterial character; and this interme-

diate condition of blood appears to produce a correspondent state of the bile : for it is matter of notoriety, that foetal bile is less active and concentrated, and abounds more in the watery principle, than that of the adult. This being granted, it necessarily follows, that whatever changes are induced in the blood in passing from the arterial to the venous condition, those changes furnish the principles which adapt the blood more completely to this purpose. But as physiologists are not agreed respecting the essential difference between arterial and venous blood, whatever may be the properties possessed by the one, of which the other is destitute, any reasoning founded on such an uncertain basis,

must necessarily be vague and inconclusive.

22. BUT to revert to the economy of the liver in the *fætus*, it may be observed, that beside the blood which is sent to it by the hepatic artery and *vena portarum*, it receives a large portion by the umbilical vein.

23. To understand this, we should advert to some of the peculiarities of the *fætus in utero*. It is very generally admitted, that the *placenta* is to the *fætus* what the lungs are to the child after birth; that by both a change is induced in the blood, by which it loses the venous character, and assumes the arterial one, in such proportion as the exigencies of each may require. As soon as the change

is wrought in the blood of the *placenta*, it is conveyed by the umbilical vein to the liver of the *fætus* ; part of this blood mixes with the common blood of the *vena portarum*, and with it concurs in furnishing the secretion of the bile ; the remainder is carried into the *vena cava inferior*, by the *canalis venosus*.

24. IN the *fætus*, then, it seems, that the blood in the *vena portarum* has more of the arterial condition than that of the adult, and likewise produces a bile of less activity.

C H A P. IV.

ON THE HEPATIC ARTERY,
AND THE OFFICE OF THE BLOOD
WHICH IT CONTAINS.

S E C T. I.

By far the greater number of physiologists have agreed, that the hepatic artery carries blood to the liver for its nourishment, and that this is the only use to which it is destined. There are a few, however, who incline to a different opinion; and contend that, in ad-

dition to this function, it concurs with the *vena portarum* in the secretion of the bile.

2. THE reasons on which this latter opinion is founded, have at least speciousness to recommend them; and in our inquiry into this question, the merits of both opinions will be carefully investigated: and at the same time that we esteem it our duty to detect and expose fallacy wherever it appears, it is no less congenial to our inclination to ascribe to each argument its due and proper force.

3. THE first position advanced in favour of this opinion is, “ That it is
“ probable, that the office of the hepatic
“ artery is not confined to the nourish-

“ment of the liver, from the dispro-
 “portion of its vessels to the bronchial
 “arteries, which nourish the lungs.”

4. IN examining this argument, we find it is of an analogical nature ; and consequently, if well founded, cannot extend its force beyond presumption or probability. But we must always keep in view the difference between an analogy which is close, and where the points of coincidence are striking and well marked ; and one where they are but few, and those not very evident. Even the former will always fall short of proof ; while the latter can scarcely warrant so much as a conjecture.

The object therefore which is held out

as the analogy, cannot be too severely scrutinized.

5. THIS argument, then, rests on a presumption, that the lungs, which are at least as massy as the liver, are nourished by the bronchial arteries, which are much less capacious than the hepatic artery ; therefore it has been said, if the bronchial arteries are sufficient to nourish the lungs, the hepatic artery ought to do something more than nourish the liver ; or, in other words, it ought to contribute somewhat to the secretion of bile.

6. THE inference would be natural and fair, provided it were first established, that the bronchial arteries alone nourished the lungs.

7. BEFORE the days of *Ruyfch*, physiologists, imagined that the lungs were nourished by the pulmonary artery; they were the more persuaded of this, because the existence of any other vessel going to the lungs had not been suspected. But *Ruyfch*, by his art of injecting, discovered the bronchial arteries, and these he considered as their true nourishing vessels; and what seemed to give strength and confirmation to this opinion was, that the blood, while circulating through the pulmonary arteries, possesses the venous character, and of course is unfit for nutrition; while that sent by the arteries of *Ruyfch*, is in every respect adapted to this end.

But the following arguments may be

adduced, not only from speculation, but from experiment, to prove, that the substance of the lungs is nourished by the blood in the extreme branches of the pulmonary artery; and that the bronchial arteries of *Ruyfch* are confined to the nourishment of the branches of the *bronchiæ* alone.

As the blood in the smaller branches of the pulmonary artery is exposed to the influence of the air, it must necessarily receive a change, and assume the arterial character; in which state it is as fit for nutrition as the blood circulating in other arteries.

We learn from observation and experiment, that when inflammation has occasioned the surfaces of the *pleura* and

lungs to adhere, such adhesions become vascular, and may be injected by the pulmonary artery: and, as the blood distributed to these adhesions is for the purpose of their nourishment, their communication with the ultimate branches of the pulmonary artery proves incontestibly, that such blood is fit and proper for the nourishment of the lungs.

Hence it appears, that there is not the least analogy between the liver and the hepatic artery on the one hand, and the lungs and the bronchial artery on the other. Consequently the argument, which rested on this analogy, is not entitled to notice.

“ A second argument in favour of
 “ the hepatic artery assisting in the se-

“cretion of bile, is founded on an
 “apparent communication between the
 “ultimate branches of those vessels and
 “the beginnings of the biliary ducts;
 “for (say the advocates for this doc-
 “trine) a subtile fluid may be injected
 “with ease from one set of vessels to
 “the other.”

That the biliary ducts may be filled
 by a subtile fluid injected into the artery,
 we shall not deny; but this fact does
 by no means prove a direct communi-
 cation between one set of vessels and the
 other, as will very soon appear.

When we reflect on the circulation
 through the liver, it must be evident to
 us, that, as the hepatic veins return
 blood both from the hepatic artery and

the *vena portarum*; the hepatic artery has communication with the latter by the intervention of the hepatic veins, and that a fluid injection thrown in by the artery, will pass very readily into the veins; where, if its *exit* be prevented by tying them up, it may regurgitate into the terminations of the *vena portarum*, and thence escape into the *pori biliarii*.

But lest this explanation should be objected to as being too circuitous, another offers itself which is much more direct, and which admits of proof from injection.

Water injected by the hepatic duct passes with freedom into the hepatic veins; and again, a similar fluid passes

easily from the veins into the duct: hence a fluid, injected by the artery, passes first into the veins, and afterwards into the *pori biliarii*; so that the arguments founded on the phænomena resulting from injections, cannot be admitted as proofs that the hepatic artery exercises a secretory function.

The capacity of the hepatic artery with respect to the bulk of the liver, has been the ground on which its subserviency to the secretion of the bile has very much rested; from an idea that it carried to the liver more blood than the mere purposes of nutrition required: hence it was imagined, that it either co-operated with the *vena portarum* in the immediate act of secretion, or that

it separated from the blood circulating through its extreme branches, a fluid which formed one of the constituent parts of the bile.

But the capacity of the hepatic artery does not necessarily suppose either one or the other of these offices; for it is well known, that parts of the body, which are not secreting organs, are furnished with a larger proportion of arterial blood than the liver: of this kind are the muscles; the brachial artery being larger with respect to the arm, than the hepatic artery is with respect to the liver.

Now muscles, we know, are organs which occasionally perform strong and repeated actions, which, like other

actions when long continued, tend to debilitate and exhaust the machine ; but, when their exertions are moderate, they become invigorated and enlarged, and the increase of bulk which they acquire in this way, is principally owing to an increase in the capacity of their blood vessels, as appears, not only from the more florid colour of those muscles, but likewise, from comparing the capacities of the trunks of the vessels with the muscles themselves.

Tendons, on the contrary, though parts equally alive, yet, from their more passive condition, require a supply of blood sufficient only for their nourishment.

The brain is an organ which, with

relation to its bulk, receives a larger quantity of blood than any other part of the body, yet its function as a secreting organ is not obvious.

The inference intended to be drawn from these facts is, that parts, though not secretory, require a supply of blood in proportion to the actions they perform.

Now surely we cannot hesitate to admit, that the exertion of a secreting organ necessarily implies a considerable supply of vital energy ; as it consists in changing the blood into a fluid different in all its properties from the blood itself, so that it may assume a new mode of existence. In other glands, arterial blood serves the double purpose of being the

pabulum of the secretions, and of supplying the organ with vital energy sufficient to effect its purpose; but in the liver, where the secretion is performed from venous blood, which is unfit for furnishing it with vital energy, the necessity for a copious quantity of arterial blood seems very evident.

An extraordinary example of *Lusus Naturae* occurred to Mr. Abernethy, a gentleman of distinguished character both as practitioner and teacher, in this metropolis. In this instance, the vena portarum had a single termination: instead of conveying its blood into the substance of the liver, prior to its termination in the inferior vena cava by the intervention of the hepatic veins, the blood returned by the

veins of the different chylopoietic organs, was conveyed by the vena portarum immediately into the vena cava inferior, near to the origin of the emulgent veins. The hepatic artery, which appeared to be somewhat enlarged, was the only vessel carrying blood to the liver, and in this individual instance it appeared to perform the double function of nutrition and secretion. That bile was secreted in this place, appears evident both from the presence of it in the intestines and gall-bladder. The latter however, was rather smaller than common, and contained only about half a tea-spoonful of fluid, which was yellow and bitter, but not so acridly or nauseously bitter as common bile. — The

subject of the present case was a child apparently about one year old, in every respect well nourished.*

This singular case certainly appears to shew, that to a certain degree at least, arterial blood is capable of furnishing the principles necessary to the formation of bile. But it would nevertheless be carrying the argument it affords too far, to conclude from thence, that venous blood is not particularly fitted for the purpose; and, that it is merely on account of some convenience perhaps in the distribution of vessels, that the liver is chiefly supplied by a vein rather than by an artery. An extended view of the animal economy proves, that however

* *Phil. Transf. for 1793. Part I.*

simple the *means* may be which Nature employs, she is always complex in her objects; and that there is not a single organ in the body, which does not fulfil a double purpose. Whenever, then, we observe a peculiarity so remarkable as that which takes place with respect to the supplying the liver with blood, we may I think infer, that in the natural structure and condition of the body, the venous blood alone yields the bile, as being that which chiefly contains the principles necessary to its formation. The power which nature displays, in compensating for any disadvantage occasioned by a departure from her ordinary plan, is often truly surprising; but it does not appear that in the instance

related above, the compensation for the defect of venous blood was complete; for the circumstance of the gall-bladder being smaller than usual, would seem to shew, that the quantity of bile secreted was also proportionally less; and its quality, as far as could be determined by its taste, was evidently weaker than common bile. It may therefore be questioned, whether this scanty and dilute fluid, though sufficient for the ordinary purposes of infancy, would have been adequate to the purposes of the animal economy in more advanced life, when the food is considerably changed, and bile of greater activity is secreted. We have an argument in favour of this conclusion, drawn by analogy from

what happens in the case of mal-conformation of the heart, when it is such as permits a large portion of the blood to go the round of circulation without passing through the lungs, and undergoing the usual change made in it by the respiratory process. Under these circumstances the functions of nutrition and growth are carried on tolerably well for a few years; but scarcely ever to the age of puberty. It is therefore not improbable, that although the subject of this singular conformation of the hepatic system appeared well nourished, yet that the unusual structure may have been either primarily or secondarily a cause of its death.

Admitting the *vena portarum* alone

then, to be the secreting vessel, and that the hepatic artery furnishes blood only for imparting a due degree of energy, it still remains a question, of what nature the communication between these two vessels is. Perhaps here it may be more consonant to the true spirit of physiology, to content ourselves with the fact, and to trace its application to the economy of this organ, than to enter into hypothetical speculations, which, though they might help to amuse, might also tend to mislead the young student, and could add nothing to the information of the more advanced practitioner.

C H A P. V.

INTERIOR STRUCTURE OF THE
LIVER.

S E C T. I.

It is from the blood circulating through the branches of the *vena portarum*, that bile is secreted ; but in what particular part of this system the change commences, and what is the precise structure of parts adapted to this end, are fit subjects for inquiry.

2. IT has been already observed, that the ultimate branches of the *vena portarum* have a double termination; one of which is, with respect to the circulation of red blood, by the beginnings of the hepatic veins; the other, with respect to the immediate secreting vessels, by the *pori biliarii*.

3. DOES the change commence in the small branches of the *vena portarum* before they terminate in the hepatic veins?

4. THIS is scarcely probable; for any bilious properties, which the blood may have acquired at this part, would be lost with respect to the hepatic duct, as it finds a more ready course through the hepatic veins: besides which, the

constitution would be in a continual state of jaundice.

5. THE probability is, that there is no sensible alteration induced on the blood of the *vena portarum* before it terminates in red veins. And as arteries terminate in veins by capillary vessels, so, from the analogy which obtains between the *vena portarum* and an artery, we presume that the same termination does not take place until the branches have become capillary.

6. IT follows from this, that the true secreting vessels are the very ultimate branches which communicate with the *pori biliarii*.

7. THE next question is, how far the secretion of bile is connected with any

peculiar arrangement or structure of these parts; or, in other words, whether the secreting vessel communicates with the beginnings of the excretory duct by a cylindrical continuation of canal, or by the interposition of a cell or follicle.

8. ON this point, the opinions of *Malpighi* and *Ruyfch* divide anatomists. *Malpighi* having examined into the structure of glandular bodies, observed bundles of circumscribed knotted appearances assuming a globular form, to which he gave the name of *corpora globosa*; and, on further examination by means of injection, he found them still more conspicuous in consequence of distention: hence he inferred that

they were hollow, and that each of them consisted of a cell or follicle.

9. RUYSCH, it seems, in the earliest part of life, embraced this opinion ; but from employing himself, frequently, in exploring the structure of glandular bodies by injection, he was led to relinquish the doctrine of *Malpighi*, and to institute another which seemed to him more consonant to nature.

10. FROM his injections he was induced to believe, that the appearances described by *Malpighi* were fallacious ; and that they were not mere *cryptæ*, or cells, as they had been represented, but consisted of a series of vessels coiled up in a circumscribed form, and, that the ultimate branches of the secreting vessel

communicated, both with the returning vein and excretory duct by a continuation of canal.

11. WITHOUT examining the merits of these doctrines, as applied to different glandular bodies, we may observe, that in the liver there are some appearances favourable to the Malpighian opinion. If a subtile injection be thrown in by the *vena portarum*, and the liver be afterwards cut into thin slices, there will be found knotted appearances, that bear a strong resemblance to cells, and which, from their equality of bulk, and uniformity of shape, cannot be considered as the produce of extravasation.

12. THE kidney likewise, when the emulgent artery is minutely injected,

exhibits, in its cortical part, knotted appearances equally regular with those in the liver.

13. BUT here again the question returns upon us,—*Do they, or do they not, consist of assemblages of vessels ; or are they mere cavities ?* Feeling my incapacity of solving this problem to the satisfaction of my readers, I must beg leave to withdraw myself from the contest in the beautiful language of the Roman poet,

“ Non nostrum inter vos tantas componere lites.”

C H A P. VI.

COURSE OF THE BILE.

S E C T. I.

CONFESSING, then, our inability to determine the precise structure and mechanism of the parts which form the immediate seat of secretion, it remains to trace the course of the bile, from the interior part of the liver to the place destined for its reception.

2. THE bile being formed, is con-

veyed from the seat of secretion, by the branches of the hepatic duct, which, at their origin, are very minute, and are there called *pori biliarii*. From these it passes into larger branches, and thence gradually into the trunk of the hepatic duct.

3. It is probable that the bile is not merely conveyed through these passages, but that it undergoes, during this course, a change from a dilute to a concentrated state ; for the numerous absorbents with which the liver is supplied, and which originate from its interior parts, make it highly probable, that the more aqueous particles are removed by these vessels, and carried into the circulation ; leaving

the remaining fluid in a more concentrated state.

4. THE bile having arrived at the trunk of the hepatic duct, naturally passes forwards into the *duodenum*. But we are not to consider its motion as uniformly progressive, and without interruption; for it is probable from the oblique manner in which the biliary duct perforates the substance of the intestine, that the peristaltic motion of that gut, consisting in part of the contraction of its circular, and in part of that of its longitudinal fibres, will, by compressing the duct at its termination, occasion frequent, but momentary interruptions.

5. DURING these periods, the duct

must necessarily suffer a degree of distention, but which is soon relieved by means of a canal of communication with the gall-bladder, viz. the cystic duct.

So that it appears, that the motion of the bile is not constantly in the same direction, but sometimes passing from the liver to the intestine, at others, from the intestine to the gall-bladder.

6. IN most subjects that we examine, this receptacle contains a considerable quantity of bile; on an average, an ounce may be about the quantity.

7. IF this bile be compared with that of the hepatic duct, it will be found thicker in its consistence, of a darker colour, and more pungently bitter; for here also, as well as in the liver, there

are numerous absorbents, which remove the watery parts. But it is probable, that the increased viscosity depends in part on the mucus secreted by the gall-bladder itself, so that cystic bile may be considered as a compound fluid.

8. THE gall-bladder then, appears to be an occasional receptacle for the bile, whenever there is an impediment to its passage by the common duct into the intestine; and this, as a *diverticulum*, prevents a surcharge, which otherwise would probably take place in the hepatic duct.

9. THAT this purpose is answered, is probable from what takes place when, from any cause, the cystic duct is obstructed; for in this case, the bile,

finding no passage into that receptacle when its course into the *duodenum* is obstructed, necessarily accumulates in the *ductus choledochus communis* and *hepaticus*, and consequently, enlarges the capacity of those canals.

10. FOR a proof that this is a law of Nature, we appeal to the dissection of morbid bodies where this complaint existed; and there is a case in point, related by Dr. Ludwig, of Leipzig, in which the *ductus choledochus communis* was dilated to more than an inch in diameter.

11. THIS explanation of the course of the bile to and from the gall-bladder, appears the most satisfactory, and is that most usually received; but the

establishment of it has met with opposition upon two grounds.

First, That the gall-bladder secretes its own bile ; and

Secondly, That the branches of the hepatic duct, while in the substance of the liver, detach small canals leading immediately into the cyst ; and from which they have received the compound name of *hepatico-cystic ducts*.

12. THE principal supporter of the former of these propositions is *Albinus*. He was led to this, from the vascularity of the gall-bladder ; from its internal surface having an appearance resembling follicles ; and from the gall-bladder having been found distended with bile,

when the cystic duct was completely obstructed by a gall-stone.

The two first arguments are barely presumptive; it will therefore be unnecessary to refute them in form.

The last, being more specious, may deserve some consideration: we will begin with admitting the fact.

13. Now it is well known, that the gall-bladder frequently contains biliary *calculi*, at the same time that it is distended with bile. Supposing, then, that one of these concretions happens to make its way into the cystic duct, and that the patient, being of an irritable habit, dies from this, or from any other cause, and the body be examined under these circumstances; in such a case the

gall-bladder will be found distended with bile, when its retrograde course by the cystic duct is obstructed: but this distention is from the bile previously contained in that receptacle.

Here then is a source of fallacy.

14. BUT though it be true, that the gall-bladder is sometimes distended with bile when the cystic duct is obstructed, it is no less so, that it is sometimes found empty, and sometimes containing a fluid, composed principally of its mucus, tinged with a small quantity of bile; circumstances which could scarcely be supposed to happen, if there were the direct communication contended for.

15. BESIDES, the opinion relative to the existence of the hepatico-cystic

ducts require direct proof: they have been often sought for, in vain, in man and in other animals. In the ox some have contended for their existence. In the serpent tribe they certainly do not exist; for in these animals, the gall-bladder is detached from the liver, so that there is no possibility of communication, except by the intervention of the cystic duct. In the human subject, their existence may be easily disproved by the following experiment.

16. IF the gall-bladder be emptied of its contents, and either air or water be injected into the liver by the hepatic duct, neither of them will penetrate into the gall-bladder. Now, as fluids of so subtile a nature as these, would readily

pervade those ducts if they existed, we necessarily conclude, that the gall-bladder receives its bile by the cystic duct.

17. BUT the causes which determine the retrograde course of the bile from the *ductus communis* into the gall-bladder by the *ductus cysticus*, are not constant and uniform in their operation; they admit of intervals, during which this motion of the bile is either entirely suspended, or changed for one directly opposite. Were it not so, the gall-bladder would be in a constant state of surcharge, and, of course, become distended to an enormous size, so that there would be danger of its being ruptured.

18. To guard against this evil, a

part of its contents is occasionally discharged, from the pressure of the surrounding parts upon it. Thus, this pressure will vary somewhat in its force, from the different degrees of distention of the stomach by food: and when the stomach is distended, there is the most copious flow of bile from the *duodenum*.

19. From this mode of discharging its contents, the gall-bladder is considered as a passive receptacle. But this idea has been controverted; at least it has not always been admitted in the extent here stated. Arguments founded on analogy have been adduced to prove, that it possesses some active power on its own contents; and that, though assisted

by the preffure of adjacent parts as acted upon by the diaphragm and abdominal muscles, yet, that there is inherent in it, a power by which it co-operates with those agents, and relieves itself from any accumulation.

20. THE analogy here alluded to, is that of the urinary bladder, which, by its own muscular power, is able to evacuate its contents.

21. DILIGENT search has been made by anatomists to discover muscular fibres in the gall-bladder; and such fibres have been described, but their precise direction is not yet agreed upon. This difference of opinion, though it does not disprove their existence, yet weakens the probability of it; for, an appear-

ance so equivocally and indistinctly marked as to admit of a diversity of description, divides the mind too much to favour any doctrine on the subject.

22. THIS difficulty has induced anatomists to adopt another criterion of muscularity, viz. *irritability*; and experiments have been instituted, with a view either to establish or to disprove its presence. Various stimulating powers, both chemical and mechanical, have been applied to the gall-bladder, without producing any evident contraction. Mechanical *stimuli*, indeed, produce no effect; and when any contraction has followed the use of chemical applications, it has been confined to such as acted by a corroding quality; and

the apparent contraction has been nothing more than the corrugation which may be induced on inanimate animal matter. Upon this subject the experiments of Baron Haller appear to be sufficient and decisive.

23. HAVING explained the powers by which the bile is conveyed from the liver and the gall-bladder into the duodenum, we are naturally led to contemplate the means by which its return from the duodenum is prevented.

24. THE contrivance is simple and effectual. It consists of nothing more than the oblique manner, in which the common biliary duct passes through the coats of the intestine, from the external

to the internal surface, and by which the office of a valve is performed; so that while the bile has a free passage from without inward, the orifice of the duct collapses when a contrary direction is attempted.

25. The causes which impede the flow of bile in to the *duodenum*, are generally very transient in their operation, during which there is only a moderate surcharge of the ducts, and no material inconvenience ensues. But it not unfrequently happens, that the obstruction is of a permanent nature; in which case the bile is necessarily detained in these parts for a time; after which, it finds its way into the mass of blood, where, by being circulated through

every part of the body, it gives yellowness to the skin, and produces jaundice.

26. THE causes which occasion this obstruction are various. A very common one is, the presence of a gall-stone either in the hepatic or common duct; perhaps the latter is more general, as biliary *calculi* form more frequently in the gall-bladder, where the bile is in a state of quiescence, than in the branches of the hepatic duct, where it is in motion.

27. SOMETIMES a stricture of the common duct is an obstructing cause; such as have been discovered after death, are usually of that permanent kind connected with a diseased condition of this

part, a removal of which can scarcely be hoped for.

28. BUT a cause of jaundice has been referred to a spasmodic stricture of this duct, and which, as not being connected with a change of organization, may attack by paroxysms, returning at indeterminate periods.

29. WITHOUT examining into the symptoms which have been supposed to characterize this cause, it may possibly be thought a sufficient refutation to prove, that the biliary ducts of a living animal possess no marks of irritability when acted upon by *stimuli*; the contrary of which we should expect were they furnished with muscular fibres.

The only part of the common duct

liable to spasmodic affection, is that which passes through the coats of the *duodenum*, which may be acted upon by the muscular fibres of that intestine; and here we should distinguish between the contraction of the intestine in which the biliary duct is passive, and a contraction of the duct itself.

30. ANOTHER cause of obstructed bile consists in a pressure of the duct by the head of the *pancreas*, which is sometimes found in a scirrhus state, and which, from its connection, may easily produce such an effect: for the biliary duct, a little before it terminates in the intestine, penetrates some way into the substance of the *pancreas*, and receives the excretory duct of that gland. There-

fore the orifice which appears on the inner surface of the *duodenum* transmits, in common, the bile, and the pancreatic fluid.

31. To the causes of obstruction already enumerated, there is another sometimes annexed; viz. a scirrhus impacted state of the liver, which from a very extensive deposit of solid matter* throughout its substance, in an interstitial form, diminishes the capacities of

* The nature of this matter has not been ascertained. Does it bear any resemblance to the sperma-ecti-like matter into which the liver is almost entirely changed by long exposure to the air? See *Annales de Chymie*, tom. 3. The question might perhaps be determined by exposing equal weights of sound liver, and of one diseased in this way, to the influence of the air, or of running water, and observing which underwent the change quickest, and yielded the largest portion of the matter in question.

the *pori biliarii*, so that they are unable to carry off the bile as fast as secreted, and an accumulation of it within the substance of the liver must therefore necessarily ensue.

32'. HITHERTO the cause of jaundice has been referred to obstruction in some part or other of the biliary ducts. But there are some cases which incline us to believe, that jaundice may exist, though the biliary canals are pervious and free.—The ordinary yellow fever of the West Indies furnishes an instance in point.* The characters of this com-

* I have used the word *ordinary* here, to denote the endemic fever of these islands, that has been long known and well described; for it appears from the accounts of some late writers, who have accurately described the dreadful fever which has ravaged our fleets and armies in the West Indies this war, that the yellowness

plaint are, a diffusion of bile through the mass of blood, producing jaundice ; with an excessive quantity of it in the alimentary canal, so that it is discharged by vomiting and purging. In this case, jaundice seems to depend upon a redundant secretion.

33. BUT *Boerhaave* and *Morgagni* have favoured an opinion the direct reverse of this. They consider jaundice, sometimes, as the effect of a suspended secretion, and suppose that the blood, in consequence of this, retains a bilious

does not, as former authors had described in their accounts of the endemic of the country, begin first in the eyes, but in streaks about the mouth and neck ; and seems to depend rather upon a particular state of the lymph in the cellular substance of these parts, than upon the absorption of bile into the circulating mass. .

character, thereby giving a yellowness to the skin.*

* Though there is no reason to believe this in the instance of common jaundice, which is universally, I believe, found to depend upon something that prevents the bile *when formed*, from getting into the duodenum ; yet, from late experiments it would appear probable, that, under certain morbid states of the body, the blood *may* acquire a bilious appearance, independant of absorption or regurgitation from the liver. M. M. Foureroy, and Vauquelin found, that on coagulating, by means of fire, arterial ox-blood mixed with one-third its weight of water, there separated from the coagulum, a liquid, which, by a careful evaporation, afforded a matter so much like ox-gall, that many persons, without any previous information, have recognized in it the smell, colour, and taste of the secreted fluid : and a similar resemblance in every respect was shewn by chemical analysis. (*Ann. de Chymie, tom. 6. p. 181.*) It would be well worth while to try, whether venous blood would not yield this matter in greater quantity than arterial blood, and whether blood taken from the vena portarum, would not yield it in still greater quantity than either. If this last were proved by experiment to be the case, it would at once point out the reason why the liver is supplied with blood, which is perhaps more completely deprived of its arterial character than any other in the body.

34. This opinion is founded on a mistaken notion, that all the secreted fluids pre-exist in the mass of blood; and that the province of the different glands is confined to the mere mechanical separation of those fluids.

35. As there are few, if any, physiologists of the present day, who entertain such an opinion of glandular secretion,—to offer any thing of an argumentative nature, by way of refutation, would be altogether superfluous. It is now generally understood and believed, that the blood is the *pabulum* or source of all the secretions, and that the glands through which it circulates, change its properties, every one according to its peculiar mode of action; so that the

secretions may be considered as new fluids formed by their respective glands.

36. IF this idea of secretion be true, it must necessarily follow, that, if the action of the whole secreting system of the liver be arrested, no bile can be formed, and consequently none can be conveyed into the mass of blood. To argue otherwise would be to oppose every principle of reasoning; it would be imputing effects to a cause which has no existence.

37. IN every case of jaundice bile must be secreted and carried into the blood-vessels; but the channel by which it is conveyed has given rise to controversy.

38. THERE are on this subject two

opinions which divide physiologists ; some of whom assert, that the bile after secretion, is carried to the blood-vessels by regurgitation, whilst others attribute this effect to absorption.

The first opinion has most generally prevailed.

39. BARON HALLER, who introduced this to our notice, rests his opinion on the free communication of vessels in the interior part of the liver ; but more especially on a communication between the hepatic veins and biliary ducts. The proof of this communication is fair and decisive.

40. HE observes, that a subtile injection thrown in by the hepatic duct, will escape readily by the hepatic veins.

This is a fact ; and I know from experiment, that water injected in the same direction, will return by the veins in a full stream, though very little force is used. From the facility with which water takes this retrograde course, a probability arises, that if from any cause the natural direction of the bile be obstructed, it will readily obey the same direction.

This explanation of jaundice seemed fully sufficient to satisfy the mind of Baron *Haller*.

41. BUT a more extensive acquaintance with the economy of the absorbent system, has given a new turn to this speculation, and has induced a physiologist of the present day, to solve the

cause of jaundice on the principle of absorption only. This opinion rests on an experiment where the hepatic duct of a living animal was tied, and afterwards the absorbents of the liver were very much loaded with bile.

42. THIS fact certainly proves that the absorbents have the power of taking up bile ; a circumstance which I apprehend would be generally admitted, though it had not received the confirmation of experiment. But it does not invalidate the probability of a portion of bile passing into the blood-vessels by the hepatic veins: the circumstances and facts upon which that opinion rests, retain all their original force, and stand unaffected by this experiment.

43. THE question, then seems to be, whether in cases of jaundice the bile passes into the blood-vessels by regurgitation, by absorption, or by both modes?

44. THAT the absorbents take up the bile from the interior part of the liver, and convey it by the thoracic duct into the mass of blood, the following experiment will evince.



EXPERIMENT.

45. AN incision was made into the abdomen of a living dog, large enough to allow a ligature to be made on the hepatic duct; this being done, the *parietes* of the *abdomen* were brought together by futures. Two hours after,

the dog was strangled, and the parts carefully examined. On inspection it appeared, that the absorbents had been very active, for they were very much distended with a fluid of a bilious colour, and their course, which was very conspicuous, could be traced with the greatest ease to the thoracic duct, the contents of which seemed only moderately bilious. The bilious colour was in a great measure concealed by the red particles of blood, which had been extravasated by the injury, taken up by the absorbents, and conveyed into that canal. It is probable, however, that the bile was only just entering the blood-vessels, as on a very careful inspection of the eye, the tunica conjunctiva did

not betray the slightest appearance of jaundice.

46. It seems then, that during the space of two hours, the secretion of the liver had been sufficient in quantity to distend its ducts,—to stimulate the absorbents to relieve that distention, and to allow of a small portion of their contents to be conveyed into the blood-vessels.

47. But it still remained for determination, whether or not a small quantity of bile was not regurgitating by the hepatic veins during the process.

48. To ascertain this, a second dog was procured, and a ligature made on the hepatic duct as in the preceding experiment. Two hours after, blood was taken from the jugular vein, and

set to rest, in order that it might separate into its *serum* and *crassamentum*. The liver was then drawn down a little from the diaphragm, and blood taken from one of the hepatic veins. This blood, as well as the former, was allowed to separate into parts : and on immersing pieces of white paper into the *serum* of each, *that* taken from the hepatic veins gave the deeper tinge, the *other* produced only a very slight degree of discoloration.

49. IN this experiment, the period of examination was the same as the last, viz. two hours ; a space of time just sufficient for the bile to begin to make its way into the circulation, without getting in in such quantity as to tinge

in any sensible degree the general mass of blood. Hence we see evidently, why the blood which was returning from the liver by the hepatic veins, contained a larger proportion of bile than that taken from the general circulation.

50. As the first of these experiments proves, that the absorbents of the liver are concerned in the production of jaundice, so the last demonstrates with equal force, that when from the operation of any obstructing cause the bile is accumulated in its ducts, so as to distend them in a considerable degree, Nature relieves herself, in part, by allowing a portion of it to take a retrograde course by the hepatic veins.

C H A P. VII.

B I L E.

S E C T. I.

BILE appears to the eye a perfectly homogeneous fluid, of a deep yellow or brown colour, which is changed to a bright yellow by dilution with water. The cystic bile indeed, is frequently green, and sometimes so considerably so, as to appear almost black ; but even this when diluted, exhibits more or less

of a yellow hue. Hence it is, that this fluid, when carried into the blood, and diffused through the *serum*, occasions the yellowness in jaundice.

2. THE consistence of bile is usually viscid, and its tenacity is sometimes such, that it cannot be poured from a phial in drops, but is drawn out into threads like the *albumen*. It is observed to be more viscid in the human subject, than in brute animals.

3. BUT a question may here arise, how far this tenacity is essential to the bile, or whether it may not be explained on the principle of its being a compound fluid, consisting in part of bile, with a portion of that mucus which is secreted by the gall-bladder; for it is

the bile contained in this receptacle, which is usually the subject of chemical experiment.

4. WHEN bile is agitated in a phial, it forms a lather like that from soap and water; and that it really possesses saponaceous properties, is rendered highly probable from the use to which it is applied by the scourers of cloth; it being known to assist very powerfully in the removal of greasy spots.

5. To these sensible properties we may add its *taste* and *smell*; the first being intensely bitter, with a degree of pungency; the last of a faint and nauseous kind.

6. FROM this assemblage of properties, we naturally presume, that bile is

a saponaceous fluid, combined with a mucilaginous substance from which it receives its tenacity ; and to these are superadded—the colouring matter, and the principle of bitterness.

7. IT is therefore the province of chemistry to determine, by careful and accurate investigation, in what degree these conjectures concerning the nature of that fluid, can be confirmed by experiment.

8. IN the first dawnings of chemical knowledge, when our acquaintance with the agents of chemistry, and their effects on matter, was narrow and confined, the means usually employed to ascertain the component parts of bodies, were seldom any other than those of

subjecting them to distillation, by different degrees of heat from the less violent to the more intense. Having exerted the whole power of the furnace in this way, the inquirers thought themselves in possession of a very perfect *analysis* of every body which they thus submitted to investigation.

9. BUT reflection and an extended state of knowledge at last convinced them, how remote they were from a thorough acquaintance with the constituent parts of bodies; and their unsuccessful attempts to reproduce the original substance, by a recombination of such of its elements, as they, in this way, were able to collect, soon convinced them, that another, and less fallible mode of

prosecuting these inquiries, was very much to be wished for.

10. BESIDES, they were not acquainted with the nature of the agent they employed, either abstractedly, or in a state of combination with matter; therefore the changes thus induced, could be but imperfectly understood.

11. To guard against this difficulty, another and more natural mode of investigating bodies was introduced, viz. the forming of different compounds by the addition of certain chemical reagents; and in this way it was found, that a more correct analysis could be obtained. Thus the torturing of bodies, by the application of *heat*, necessarily

yielded to the more natural examination by chemical attractions.

12. IT is by no means intended here to proscribe altogether the agency of *heat*, it being often found essentially useful, as an auxiliary to the chemical bodies employed; enabling them the better to effect their different decompositions and combinations.

13. A QUANTITY of *recent ox bile* being procured, several experiments were instituted, with a view to ascertain its component parts.



EXPERIMENT I.

14. A PORTION of it, being received into a shallow earthen vessel, was eva-

porated cautiously by a moderate heat. On examining the vapour, it appeared to be principally water possessing neither acid nor alkaline properties, but strongly impregnated with that principle in which the peculiar odour of bile chiefly resides. The *residuum* gradually inspissates and assumes the form of an extract; which, if the evaporation be carried sufficiently far, will become as brittle as resin, and may be pulverized with equal ease.

15. FROM this experiment we learn, that the fluidity of bile depends chiefly on *aqueous* matter; and that in the exhalation of it, even by the more moderate degrees of heat, it is accompanied

by the odorous principle, which, it seems, is of a very volatile nature.

16. As bile possesses a considerable degree of tenacity, and as the tenacity of animal fluids depends chiefly on a mucilaginous principle, it was determined next to ascertain, whether that principle gives visciditv to the bile.



EXPERIMENT II.

17. ON a portion of bile was poured a quantity of alcohol; a *coagulum* was immediately formed, which floated in a green liquor. On filtering this compound, the green fluid readily passed, while a mucilaginous substance of considerable tenacity, was detained by the

paper. This mucilage was of a whitish colour, and possessed only a slight degree of bitterness, while the filtrated liquor preserved both the bilious colour and taste. It is scarcely necessary to add, that it was free from viscosity. The GLUTINOUS principle of the bile then appears to reside in an animal mucilage.

18. THE *fluidity, odour, and viscosity* of bile being thus accounted for, we are next led to the investigation of the principles on which its *bitterness, colour, and saponaceous quality*, depend.

EXPERIMENT III.

19. To a quantity of recent bile, was added a diluted marine acid; a coagulation was produced. The fluid separated by the filter was of a green colour, but much lighter than that of bile; and, notwithstanding the predominance of the acid, the bitter taste was very distinguishable.

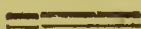
20. THE more solid matter detained by the filter, was very glutinous, of a green colour, and intensely bitter.

EXPERIMENT IV.

21. Two other portions of bile were put into proper vessels; to one was

added a diluted vitriolic, to the other a diluted nitrous acid. Both exhibited *phenomena* fimilar to thofe in the laft experiment. The filtrated liquors were green and bitterifh; the *coagula* intenfely fo, and glutinous.

22. As, in thefe experiments, the decomposition appeared to be incomplete, it was thought eligible to try, whether or not a more perfect feparation might be obtained by the affiftance of heat.



EXPERIMENT V.

23. A QUANTITY of bile and diluted marine acid were put into a flask, and placed in a fand bath until they had acquired the boiling heat. On infpection,

the separation into parts was very evident ; and on committing it to the filter, it separated a colourless fluid destitute of every bilious property. The *residuum* consisted of a very dark green mass, intensely bitter, and extremely glutinous. When examined, it appeared to be composed of an animal mucilage, in combination with a resinous substance.

24. BUT to ascertain in what way the acid had effected the decomposition, it became necessary to examine the filtrated liquor. It was therefore subjected to a cautious evaporation, and, at a proper period, was suffered to cool.

25. UNDER cooling, crystals were formed of a cubic figure, which decre-

pitated by heat, and possessed all the characters of common salt.

Therefore, the decomposition was here occasioned by the marine acid engaging the mineral alkali, which it separated from the other element of the saponaceous body, and, by uniting with that *basis*, formed common salt.

26. BUT, notwithstanding we are able to account for the production of common salt in this way, it does not exclude the possibility of a small quantity of it pre-existing in the bile, independent on this artificial combination of its elements.

27. TO satisfy my doubts on this point, the following experiment was made.

EXPERIMENT. VI.

28. To a portion of bile was added alcohol, in quantity sufficient to set loose all its mucilaginous matter. The fluid part, being separated by a filter, was examined by nitrated silver, but no *luna cornea* was produced: therefore the marine acid does not appear to have any existence in the bile.

29. FROM this experiment we learn, that the saline *basis* of the saponaceous matter of the bile, is the mineral alkali; but the other element is still a question.

EXPERIMENT VII.

30. To determine this point a quantity of bile was decomposed by a diluted marine acid, assisted by heat (as in Experiment V.) The *coagulum* detained by the filter was examined. It appeared to possess most of the characters of bile in a solid concentrated state. It had a pungent bitter taste, dark green colour, and was extremely glutinous. When perfectly dry, it was very inflammable, and burned with as much rapidity as any bituminous substance would do.

31. THIS appearance led to a suspicion of the presence of a resin, but as a higher degree of certainty was still

wished for, further experiment was necessary.

EXPERIMENT VIII.

32. I THEREFORE diffused a portion of this *residuum* through rectified spirit of wine: a large proportion of it was dissolved, which imparted to the spirit both the colour and taste of bile; the insoluble part being chiefly of a mucilaginous nature.

33. FROM the facility with which alcohol dissolves the green and bitter part, it is scarcely probable, that it partook of the nature of an unctuous oil; but that it was either a resinous body, or a kind of essential oil.

34. THIS point was easily determined; for, on the addition of water to the solution, a precipitation took place. The filtered liquor was colourless, and free from bitterness. The *residuum* was nothing more than a resinous substance, in which resided both the colouring principle and bitter taste.

35. ON taking a retrospect of the above experiments, the bile appears to be resolvable into the following elements, viz.

35. First,—Water, impregnated with the odorous principle.

Secondly,—A mucilaginous substance resembling the *albumen*.

Thirdly,—A resinous substance con-

taining the colouring principle and bitter taste. And

Fourthly,—The mild mineral alkali.

36. WITH respect to their combination, it seems that the saponaceous matter consists of the bitter resin in union with the alkali: this admits of a ready union with a mucilage, and with this again the aqueous matter very readily combines, so that the whole forms a mass apparently homogeneous.

37. THE following experiments were instituted, with a view of examining some doctrines, founded on the bile having a greater power of resisting putrefaction than the blood.

EXPERIMENTS IX. & X.

38. EQUAL quantities of blood and bile of the same ox were each put into a different vessel of the same size, and exposed to the same degree of heat. On the third day the blood began to give out, by its odour, marks of putrefaction; the bile remained in its natural state.— On the fourth day the bile had a pungent odour by no means ungrateful, while the blood was extremely putrid. On the sixth day the bile became putrid, and had a very offensive smell. Hence it appears, that the bile in a healthy animal is less disposed to putrify than the blood.

C H A P. VIII,

ON BILIARY CALCULI.

S E C T. I.

BEING favoured by Dr. Baillie, with an opportunity of examining the structure and general appearance of biliary *calculi* in his collection, I found that they are very generally either of a lamellated or radiated structure: on the outer surface chiefly of the former; on the inner of the latter. The colour is

extremely various: in some they are of a light colour, approaching to a white, in others as black as jet; in many of a brown or ochry appearance: these last have generally a very bitter taste; the radiated part is frequently white, and without taste.

2. THEY are, very generally, inflammable, and fusible in the fire; and, for the most part, they are soluble in spirit of wine, and oil of turpentine. There are some, however, which are not soluble in either of these fluids. Many of them have the consistence of *phosphorus*, and cut like wax.

3. IN the radiated *calculi* there is a substance, in every respect like *spermaceti*. Some *calculi*, instead of burning

with a flame, only become red, and consume to an ash, like a cinder.

4. THIS variety in the appearance of calculi clearly evinces that they are not mere inspissations of bile, but that there is a difference either in the component parts themselves, or in the proportion of those parts.

5. THEREFORE, in chemical investigation, it seems necessary that experiments should be made on different specimens; as it is probable, even *a priori*, that the result of experiments made on one specimen, will not apply very strictly, to a series of inquiries made on another.

6. As we presume, from bare inspection, that these calculi are not mere

inspissations of bile, but that they contain principles which are not to be found in that fluid, it affords a subject of rational inquiry to determine—what are those elements, and of what nature is their combination?

7. To ascertain this, several experiments were instituted on a calculus of the following characters.

The external surface was of a chocolate colour; when rubbed off, it had a lighter coloured layer underneath.

On making a section through its centre, it appeared to be composed of lamellæ.

It was rubbed to powder very easily.

Its taste was moderately bitter.

It was fusible by heat, and when in-

flamed, burned like a resinous substance.

Ol. terebinth. unaided by heat, dissolved a very large portion; but alcohol, under the same circumstances, dissolved only a small part.

8. To determine how far the agency of heat could assist the solvent power of alcohol, an experiment was made.



EXPERIMENT.

TWENTY grains of this calculus were infused in an ounce of alcohol, and, after previous agitation, the phial was placed in a sand bath. Before the fluid had arrived at the boiling point, it dissolved nearly the whole of the substance. The clear liquor, being poured from the

residuum, was suffered to cool. Under cooling, the whole assumed the appearance of a solid crystallized mass.

EXPERIMENT.

9. A SMALL quantity of alcohol being poured on this residuum, and assisted by heat as before, exhibited very little solvent power. These experiments shew, that there is a small proportion of this biliary calculus, which resists the solvent power of alcohol. What is its nature?

EXPERIMENT.

10. To this residuum was added a quantity of diluted Muriatic Acid. A

sufficient time having elapsed, the fluid was committed to the filter. To the clear liquor was added a portion of the Aq. Kali, when a white precipitation, apparently of an earthy nature, immediately took place.*

Hence one point in which a biliary calculus differs from fluid bile, is, in containing a quantity of earthy matter.

II. THE crystallized mass formed by the alcohol, was next subjected to examination. Some of the phenomena already related, having led to a suspicion, that a resinous matter forms one of the constituent parts of biliary calculi,

* I suspect it to be of an earthy nature, not only from its solubility in an acid, but from its possessing no inflammability.

the proof of it was reserved for the following experiment.

EXPERIMENT.

12. THE crystallized mass, being made fluid by heat, was poured into a pint of water; a white flocculated precipitate was immediately formed, leaving an opaque supernatant liquor. The whole was committed to the filter, and the solid part being collected and dried, was found to be of a resinous nature.

EXPERIMENT.

13. TO the clear filtered liquor was added a small quantity of diluted marine

acid, from a suspicion that an alkaline principle might form one of the constituent parts of a gall-stone, as well as of the bile, and by that means a small portion of the resinous substance might still be held in solution ; but no precipitation followed. This experiment makes the presence of an alkali somewhat equivocal ; but the following proved its existence very satisfactorily.



EXPERIMENT.

14. THE fluid mixture of the last experiment was carefully evaporated almost to dryness. On cooling, two kinds of crystals formed ; one spiculated, the other cubic. The cubes possessing the characters of common salt,

proved the presence of the mineral alkali: and the spiculated crystals, which were the common crude sal ammoniac, afforded presumptive evidence in favor of the volatile alkali. But what placed the matter beyond doubt, was the following experiment.

EXPERIMENT.

15. A DROP or two of Aq. Kali was added to these crystals, and the volatile alkali became immediately sensible.

16. FROM these experiments we infer, that this specimen of biliary calculus consisted chiefly of a resinous matter, with a small proportion of earth, apparently calcareous, combined with the mineral and volatile alkali.

C H A P. IX.

OF THE USE OF THE BILE.

S E C T. I.

GREEN and bitter bile being in common to all animals with red blood, and found only in such, makes it probable that there is some relative connexion between this fluid and the colouring matter of the blood, by the red particles contributing more especially to its formation. An opinion very generally

prevails, that the bile assists in the process of chylification, by mixing with the digested food contained in the *duodenum* : for it is demonstrably true, that the digested matter does not assume a chylous form until it has passed below that part of the intestine where the biliary and pancreatic ducts make their entrance. Upon the ground of this fact, it has been presumed, rather than demonstrated, that either all, or some of the constituent parts of the bile contribute to chylification. What foundation exists for such an opinion, the following experiment will tend to shew.

EXPERIMENT.

2. A DOG was fed with animal food, and in three hours the *abdomen* was opened.—A portion of the *duodenum* and *jejunum*, of considerable length, was cut open, so that the contents might be observed. Portions of food, reduced to a pultaceous mass, were seen oozing through the *pylorus*; the bile was likewise observed to pass slowly out of its duct, which, when carefully attended to, appeared to flow over the surface of the digested matter adhering to the intestine. Upon removing the bile from the surface of this digested matter, it did not appear to have mixed with it in any sensible degree.

3. HENCE it seems somewhat doubtful, whether the bile really forms one of the constituent parts of the chyle, as has been imagined, or not. If, however, all, or any of the elements of bile do contribute to chylication, no traces of their presence can be discovered from the sensible properties of the chyle.

4. ANOTHER difficulty in admitting this as one use of the bile, is, from the circumstances of jaundice. In this complaint, the passage of that fluid into the intestine is either completely obstructed, or very much impeded; but there are no symptoms which clearly manifest a defect of chylication.

5. ONE important use of the bile is,

unquestionably, that of stimulating the intestine, and performing the office of a purgative; for when the excretion is impeded, as in the jaundice, the intestines, being deprived of their natural *stimulus*, become torpid, and costiveness ensues.—This torpor is diffused by sympathy over every part of the system, and languor and lassitude prevail.

6. IT is probable, therefore, that even admitting the bile to contribute somewhat to the digestion and assimilation of our food; its principal office is that of a natural and habitual *stimulus* to the intestines, keeping up their energy and peristaltic motion, which may be affected either by an increase of its quantity, or

a change in its quality, produced by disease.

When however, we take a view of the constituent parts of bile, as clearly ascertained by the foregoing chemical experiments, it seems very probable, that from its resinous bitter, it may counteract any active and spontaneous changes to which animal and vegetable matter would otherwise be subject ; and that, as the propensity to acidity in our vegetable aliment is extremely obvious, the alkaline matter of bile tends to correct it. - Bile likewise, from its saponaceous and soluble quality, lessens the adhesive nature of our fæces, and, by smoothing their surface, promotes their evacuation. In cases of its defective secretion, the

fæces are hard, knotty, and irregularly fixed. One important part of digestion is ultimately perfected in the upper end of the duodenum ; and as perfect digestion is always opposed to fermentable changes, the bile is well calculated to finish that process. We probably may err in confining the use of bile, therefore, to any single operation, while from its nature it seems so well qualified to answer a variety of useful purposes in the animal economy. We shall afterwards observe, that where it is defective, its place may be supplied by artificial means with advantage ; and in no instance has the application of chemistry to the cure of diseases appeared more successful, than in suggesting the use of

proper remedies in cases of diseased and defective bile.

It frequently happens that bile is secreted in too small a quantity; as in hypochondriacal complaints, and in chlorosis: in which diseases an unusual degree of torpor takes place, expressed in the one case by dejection and despair; in the other by inactivity and languor; the stools are generally of a light clay colour, and the body is costive.

Bile, therefore, affords a stimulus by which tone and energy are communicated from the intestines to the whole body, and the defect of it in the primæ viæ, is more productive of disease than its excess. In the latter case, if it be healthy in its nature, it only proves a

salutary purgative, but if in a diseased state, it deranges the animal economy like any other foreign stimulus which may be applied to the intestines.—It likewise, from its bitterness, possesses antiseptic powers, which are peculiarly useful in the intestinal canal.



OF THE DISEASES OF THE LIVER
DEPENDING ON ITS FUNCTIONS AS
AN ORGAN OF SECRETION.

C H A P. I.

ON THE INCREASED SECRETION
OF BILE.

S E C T. I.

THE Inhabitants of warm climates are extremely subject to diseases arising from the increased secretion of bile, and the excess of its quantity in the primæ viæ, which, either by regurgitating into the stomach, produces a general languor

of the body, together with *nausea*, foul tongue, loss of appetite, and indigestion; or, by being directed to the intestines, excites a painful diarrhœa, ultimately tending to weaken their tone, and disturb their regular peristaltic motion. It generally happens that, during the excess and prevalence of bile in the first passages, some absorption of it takes place into the habit, so that the skin becomes yellow, and the urine is sensibly impregnated with it. The pulse is quicker than natural, and there is a considerable degree of thirst, with an increase of heat; the usual symptoms of fever. The body becomes emaciated, and the general aspect of the patient is extremely unhealthy.

2. UNDER such circumstances, a change of climate becomes necessary; by which the secretion of bile is gradually diminished, its powers, perhaps, rendered less active, and the healthy functions of the stomach and bowels are again restored. A sea voyage from a warm to a colder climate generally effects this purpose, supposing, as is frequently the case, that the liver and other abdominal viscera are in a sound state.

3. SUCH symptoms as I have now enumerated, are the spontaneous effects of a warm climate on healthy constitutions, independently of any intemperance; and cannot always be prevented by the most careful attention to diet, or

by avoiding such irregularities as, in all situations, contribute to produce disease.

4. THE natives of warm climates are less subject to inconveniences arising from the increased secretion of bile than Europeans who inhabit those countries. This may, no doubt, depend in some degree upon the effect which habit produces, in diminishing the inconvenience arising from the stimulus of heat. But I conceive that the difference in question may be chiefly referred to other causes. In page 147, I have mentioned it as probable, that there existed some connexion between the bile and the red particles of the blood. Now, that such a connexion does exist, and that both the quantity and activity of the bile

secreted, is, *cæteris paribus* proportioned to the abundance of red particles in the blood, appears to be proved by the following considerations. The persons who, of all others, are most subject to a redundancy of bile, are those who have black hair, a ruddy complexion, and strong fibre; and these are also the persons who have the richest blood, or that blood in which the red particles are most numerous. On the contrary, those who secrete least bile, are such as have a pale exsanguious complexion, soft hair, and lax fibre; in whom the sanguific powers are very weak: the most exquisite example of this habit is seen in chlorotic females. The influence of diet in forming blood rich or

poor in red particles, is well known; and it is equally certain, that animal food contributes most to the former, while vegetable food is chiefly productive of the latter state of the circulating mass: the florid complexion usually observable in butchers, opposed to the pallid hue for which bakers are equally remarkable, will not, perhaps, be thought the least striking among the proofs that might be adduced of this fact. The effect of acescent diet (of which kind most vegetables are) in lessening the red globules of the blood, is strikingly illustrated by the pale and watery state of it occasioned by the large use of vegetable acids; as in the case of young women, who by this pernicious

practice (often to the entire ruin of their constitution) very soon exchange the plumpness and bloom of rustic health, for the slender shape and languid paleness which accord with their mistaken notions of fashionable beauty.

Let us now compare these circumstances with those which respectively attach to resident Europeans, and to the natives of hot climates where bilious disorders are most frequent, as for example in India.—The European carries with him to India a richer blood, and a more tense muscular fibre than is possessed by the natives of that country; he is therefore, in consequence of the mere heat of the climate, disposed to generate bile in larger quantity, and of

a more active quality, than the other. But if to this we add, that as long as his health will permit him, he continues to live on a full diet of animal food, malt liquors, and wine, which still farther augment the rapidity of circulation, and consequently increase the flow of blood through the liver,—we can readily see why in such a person, the redundancy and acrimony of the bile will be much greater than in the native, who, besides having a thinner blood and less tense fibre, drinks scarcely any thing except water, and lives upon a diet composed almost entirely of vegetable matter, and that matter one of the least nutritious perhaps that man is capable of subsisting upon, viz. rice.—

When, however, the original vigour of the European's constitution is broken down by repeated attacks of bilious remitting fever, &c. and his blood becomes impoverished in proportion, then the bile is secreted in less quantity, as well as weaker in power; and this change is continued, perhaps even still farther increased, by experience having taught him the necessity of abandoning his former mode of living, and having recourse to a diet more nearly approaching that which the natives employ.

Cæteris paribus however, the bile in warm climates is, perhaps, more bitter and more saturated with its active component parts, than in colder countries;

it is therefore a more powerful emetic or purgative ; and consequently, even although it were not secreted in a larger quantity, its effects on the first passages would be more severely felt.

5. We have had occasion, in treating of the nature and properties of bile, to correct a common and prevailing opinion of its being extremely putrescent : experiments, executed with great accuracy and fidelity, sufficiently prove, that it is less disposed to putrify than any other animal fluid ; and that it even preserves, in a sweet state, animal substances, which, when exposed to similar circumstances of fluidity and heat without the admixture of bile, would in a shorter time have assumed the character

of putrefaction. It seems, therefore, to be a wise law of the animal economy, that in warm climates a larger quantity of this fluid should be prepared by the constitution than in colder countries; and by its being more bitter and more active, it possesses a greater antiseptic power than the milder and more diluted fluid of a colder climate; hence it is better fitted to correct and restrain the propensities to spontaneous and putrid fermentations, so extremely prevalent in warm climates.

6. I DO not, however, mean to deny, that many and great inconveniences are found to arise from the prevalence of bile in the primæ viæ; but I am firmly persuaded, that a diminution of its na-

tural quantity would produce diseases of a more permanent and alarming nature. It is more difficult to supply the defect in the quantity of this fluid, than to carry off its excess; it is even more easy to diminish its acrimony, than to increase its power, and thereby render it more active, and better suited to fulfil the various and important purposes which it is intended to answer in the animal economy.

7. I HAVE been frequently consulted by persons, whose appetite and digestion have been much disturbed by a long residence in tropical climates; and who, although they have generally received much benefit by a sea voyage, and a gradual return to Europe, yet require

the assistance of medicine, with a view to destroy the tendency to excessive secretion, and finally to restore strength and vigorous action.

8. AFTER obtaining all the information which I suppose necessary respecting the constitution and habits of the patient, the original and progressive state of symptoms, and the effects of such remedies as have been employed, I proceed to ascertain how far any local or organic affection of any of the viscera has taken place.—If, upon investigation, I find that the constitution has only suffered by the prevalence or the excess of bile, and that the disposition to that morbid increase of secretion still remains, disturbing the functions of the stomach,

and irritating the bowels, I recommend it to my patient, every morning before breakfast, to dilute the contents of the stomach, by drinking from half a pint to a pint of water, of a temperature from 90 to 114 degrees of Farrenheit's thermometer, likewise to take a moderate degree of exercise before breakfast. I am persuaded, that in this case water acts as a simple diluent; that tepid water dilutes better than cold water; and that pure water dilutes better than water impregnated with saline, earthy, or metallic matter.—I do not, however, mean to discourage invalids from going to places of public resort, which may contribute, by their amusements, to restore a constitution enfeebled by a

warm climate, or intense application to business; nor shall I deny that mineral waters, such as those of Bath or Cheltenham, possess considerable powers in giving tone to weak stomachs, and in promoting necessary evacuations, by exerting a more regular peristaltic motion of the intestines: a more intimate acquaintance with the power of Bath water, and a minuter enquiry into its sensible effects on the animal economy, having inclined me to think more favourably of its use, independently of its being merely an aqueous diluent.*

9. THE chemical analysis, however, of mineral waters has been of considerable advantage, since, besides the disco-

* See the author's book on Mineral Waters.

veries which it has made with respect both to the gaseous and solid contents of many of them, it has also proved with respect to others which contain but little foreign matter, that it is frequently the quantity of water, and not the impregnating substance, which does good.

I believe the experiment of drinking good pump water at home, of the temperature of Bath, Buxton, or Bristol water, has seldom been tried. I have frequently, with much success, recommended the use of warm water in dyspeptic cases; and in anomalous gout, it seems to allay the irritation of the stomach, to promote and diffuse a generous warmth in the extreme parts, and,

if taken at night, will generally produce sleep. Perhaps, besides its obvious effect of diluting the contents of the stomach, it acts also upon the principle of tepid bathing; with this difference, that as its operation is exerted upon an organ which has the strongest and most immediate connexion with the general system, the influence of that operation will be more speedily and powerfully communicated to the body at large, than it would be if the same were produced upon the skin only.

10. WATER heated to a certain degree, when taken into the stomach, will produce giddiness of the head, while the same water, of a lower temperature, will

produce no such effect.* This is one reason why patients at Bath are directed to drink the water of different springs, though not differently impregnated; and it gives rise to a refinement in practice, which has for its foundation only the different effects of temperature. It is not improbable, but that more benefit will arise when the temperature is carried to that degree which produces some sensible effect upon the head; it is impossible to lay down any general rule on this subject; it is trial alone on the individual that can determine the point of action.

* This opinion was first suggested to me by the late Mr. John Hunter, and since confirmed by observation. Warm water has a similar effect of increasing vascular action, and determining to the head, when applied to the lower extremities.—*Ed. Med. Ess.* v. 6. Art. 77.

II. I CONSIDER the waters of Heberden, Bristol, and Buxton, as not having any powers superior to common pump water, heated to the same temperature. The steadiness and uniformity, however, of their several temperatures, entitle them to some preference, and render them proper to be drunk by persons whose stomachs are irritable, and impatient of their contents, and perhaps weakened in their digestive powers by long habits of ingurgitation and gluttony, or from intense application to study, accompanied with a sedentary life.

* I find this opinion with respect to Bristol Waters, correspond exactly with that given by the late Dr. Heberden, in his "*Commentarii de Morborum Historia et Curatione*," p. 71.

12. IN all cases where bile is secreted in too large a quantity, the use of emetics is improper; they increase the irritable condition of the hepatic system, and divert the bile from the intestines. In almost all cases where vomits are given, bile, is forced during their action, from the *duodenum* into the stomach, which would otherwise have been carried off by the intestines; indeed, the actions of nausea and vomiting increase its secretion. In general, bile is a purgative sufficiently stimulating for its own evacuation, only requiring the assistance of warm water for facilitating its discharge; if, however, in some cases, it irritates without purging, I would recommend the use of small doses of

the neutral salts, such as Soluble Tartar, Sal Catharticus Amarus, and the like; and in all cases they do most good under dilution.

13. THIS suggests the propriety of recommending the use of Cheltenham water to persons returning from warm climates. It may be drank either with or without its chalybeate part; but at all events its dose should be such as to produce a purgative effect. Perhaps it would be more advantageous to take it every other morning than to use it daily: it may be well and successfully imitated by artificial means, so as to be drunk at a distance from the spring with nearly equal effect as at Cheltenham.*

* See the author's Treatise on the Chemical History, and Medical Powers of Mineral Waters, p. 277.

14. THE stomach, is greatly assisted in its energy and power, by warm clothing, especially on the lower extremities of the body. The diet of a patient, whose stomach and bowels are extremely irritable by the excess and prevalence of bile, should be moderate in quantity, and of easy digestion. This will necessarily exclude melted butter, every thing fried, every species of pastry, together with cold and raw or unboiled vegetables. Ripe fruits may be admitted, in moderate quantities, rather before than after dinner. Water, or wine and water, may be drunk for common use. Spirituous liquors of all kinds should be avoided, as having a tendency, more

directly, to produce diseases of the liver, and to weaken the tone of the stomach.

15. THE CHOLERA MORBUS may very properly be considered under the head of those diseases which depend on the increased secretion of bile. It takes place with different degrees of violence in different habits: in some it is so acute as to prove fatal in a few hours, while in others it appears only in the form of a slight vomiting and purging. In general the symptoms are as follow.

16. THE patient is seized with a violent discharge of a dark coloured fluid, in large quantity, and somewhat of a bitter taste, both from the stomach and intestines, with much pain and anxiety about the *præcordia*, together with

cramps or spasms, particularly about the lower extremities: there is a considerable degree of thirst, the pulse is extremely quick and weak. When the disease proves fatal, the pulse intermits and becomes more feeble, the extremities become cold, the patient is seized with hiccup, and dies in the same manner as persons do from inflammation of the bowels.

17. THIS disease is extremely prevalent in this country, in the months of August and September, so as to be considered as the autumnal epidemic. It frequently takes place spontaneously, and independently of any sensible occasional cause being applied; at other times it is evidently connected with a

sudden change of temperature in the atmosphere during those months, or brought on by drinking cold liquors, or by any thing else that suddenly chills the body, especially when over-heated by exercise or labour.

18. IT may likewise arise from the intemperate use of food of difficult digestion, and of acid or unripe fruits. In this country, the hepatic system is more irritable in the autumn, than at any other season : and the diseases which prevail in the months of August and September, are obviously connected with the state of the biliary secretion, and approach in their nature to such as prevail in warm climates.

19. THE fluid discharged in the

Cholera Morbus is evidently bilious, but it is bile in a very diseased state, by no means corresponding with the character of the natural or healthy state of that fluid.

20. It seems probable, that from the quantity secreted, and the rapid manner in which it is poured into the duodenum, there is not time sufficient for a perfect secretion; that the fluid therefore, is somewhat of an intermediate nature between blood and bile. Perhaps, from a hurried circulation, a considerable quantity of red globules escape, unchanged, from the capillary vessels into the *pori biliarii*, and uniting with a portion of bile, are carried by the hepatic ducts into the duodenum.

21. THE varied and increased action of a gland has much influence in determining the nature of the fluid secreted. In some cases bile is discharged, of a green colour, and extremely acrid, not possessing the qualities of healthy bile.

22. THE cure of *Cholera Morbus* is best effected, by first diluting the contents of the stomach and intestines, by the plentiful use of warm water, chicken broth, and more especially of mucilaginous liquids, so as to sheath the surface of the intestines from the acrimony of the bile, and also blunt the morbid sharpness of that fluid; and afterwards giving opiates to allay irritation. In the advanced stage of the disease, with a weak pulse and cold extremities, I

have seen great advantage from the use of opium with aromatics, as in the *Confectio Opiata*, and of musk in large doses. Every thing which has a tendency to vomit or purge actively, should be avoided; but emollient glysters may be frequently employed. If, in the first stage of the disease, symptoms of fever and inflammation should occur, the patient may lose a considerable quantity of blood, and a large blister should be applied to the abdomen. In some cases the warm bath may be employed with advantage; it is, however, chiefly to diluents and opiates that we trust for a cure.

23. THE secretion of bile is frequently increased and hurried by causes

acting on the stomach, such as sea-sickness, and emetics ; the discharge of bile by vomiting, is, therefore, no proof of its having existed in the stomach before the exhibition of the vomit, or of its having been the primary cause of nausea and indigestion : it is only the effect of direct action on that organ.

24. IN the bilious fever of the West Indies, the nausea and vomiting, which arise from some slight degree of inflammation near the pylorus and upper surface of the duodenum, invite bile into the stomach, which has no tendency to produce the fever ; it is only an effect, and not the cause of the disease.

25. IN warm climates, contagious

and febrile poisons have a strong tendency to act on the hepatic system, and greatly hurry the secretion of bile; indeed, hemorrhages from the liver, accompanying the increased secretion of bile, frequently take place, and dissection generally shows congestion and a turgescient state of that organ; this naturally suggests the use of active purgatives in those fevers, such as calomel, jalap, and the neutral salts; indeed, so specifically has the liver been supposed to be affected in these cases, that some late writers on the subject of the contagious yellow fever still raging in the West-Indies, have recommended the use of mercury, in order to produce a salivation; under which, we are assured, all

the symptoms of malignancy have subsided.

It was my intention to have considered this part of the subject very fully ; and to have pointed out the circumstances under which more especially the employment of mercury was serviceable ; together with the mode in which it probably acts in such cases. But after an attentive perusal of all that has been published by the most respectable writers on the disease in question, I find their statements so different in many respects, and the practice recommended by them so opposite, as to offer nothing but a field of controversy, without the means of coming to any clear and satisfactory decision. It must there-

fore remain doubtful, until such a mass of evidence be accumulated, as may give a decided preponderance to one or other side ; and afford a solid basis upon which we can form a rational and consistent theory.

C H A P. II.

OF THE DIMINSHED SECRETION
OF BILE.

S E C T. I.

FROM what has been already observed on the use of bile, and its application to the purposes of the animal economy, it is obvious, that any considerable diminution in the quantity secreted, will be followed by disease. The liver may be rendered incapable of secreting the usual quantity of bile, by any defect in its

structure; and that this is frequently the impeding cause, appears from dissection.

2. IT is an organ very susceptible of chronic inflammation, which, without alarming in the first instance by painful or active symptoms, gradually induces obstruction; first, with an increase, and frequently afterwards, a diminution of its bulk; perhaps ultimately obliterating the capillary vessels and *pori bilarii*, the more immediate seat of secretion. In such cases, the patient will be subject to occasional pain in the right hypochondrium, extending to the *scapulæ*, a quick pulse, an increase of heat, alternating with chilly sensations, difficult breathing on quick

motion, some difficulty of lying on the left side, flatulency, indigestion, acidity, costiveness, and, together with a gradual diminution of strength and flesh, the patient has a pale or fallow complexion. Such symptoms are accompanied with a defect in the secretion of bile, and a torpid state of the intestines.

3. IT is probable, that, under these circumstances, the original mischief is in the stomach and duodenum, and that the sympathetic action on the liver, is less than that on which perhaps healthy secretion may depend ; hence dyspeptic complaints generally precede affections of the liver, and arise from intemperance either in eating or drinking, but are more particularly induced by the

abuse of spirituous liquors, even though diluted with water. The stomach, by long fasting, has its digestive powers much weakened, by which the secretion of bile is diminished, and a diseased structure of the organ ultimately induced. Grief and anxiety of mind first weaken the powers of the stomach, and ultimately those of the liver, and thereby diminish secretion: a sedentary life will do the same.

4. HYPOCHONDRIACAL complaints are always attended with symptoms of dyspepsia and diminished secretion, and great torpor of the alimentary canal. In the chlorosis of women we have likewise a diminution in the quantity and activity of bile.

The extent and duration of pains arising from an incipient or advanced diseased structure of the liver, are so various, as frequently to deceive both the physician and patient; the pain extends to the shoulder, scapulæ, muscles of the neck, along the arm, even to the joints of the wrist. Every change of posture either relieves an old pain, or induces a new one; and bending the trunk of the body in any direction, or extending the arms, induces it. I have known patients as much afraid of a change of existing postures, as if the muscular parts of the body were under the influence of rheumatism. In the early stage of hepatic affections, no hardness or increased bulk is observ-

able; but as the disease advances, the organ as it were descends beyond the edge of the ribs, and may be felt in a hard and enlarged state,—with more or less fever during the night, encreased by the abuse of animal food and fermented liquors; pains greater in bed, and in a supine than erect posture.

5. WHEN the diminished secretion is preceded by affections of the stomach, such as loss of appetite, indigestion, and flatulent eructations, the diet of the patient should be attentively regulated; and the art of cookery should be rendered merely subservient to digestion, and the preparation of healthy chyle. The quantity of food taken at any one time should be moderate, and water

should be the only liquid drunk with our meals, as more effectually promoting digestion than fermented liquors of any kind. All raw or unboiled vegetables should be avoided; ripe fruits may be moderately taken; almost all boiled vegetables may be admitted. Animal food should be well boiled, or moderately roasted, and taken with its own gravy. Pye-crust, and every thing fried, should be excluded; butter rendered rancid by being melted, should likewise be forbidden. The patient should use moderate exercise, and drink some chalybeate water of a tepid heat, before breakfast, and perhaps in the evening.* By thus giving vigour and energy to

* As the gaseous power, however, of chalybeate waters is in general very inconsiderable, and the quantity

the stomach and duodenum, the healthy action of the liver will be restored.

6. I AM persuaded that the stomach digests solid aliment more easily than liquid and bulky food ; and that soups and broths are more quickly disposed to run into active fermentation, and require the exertion of more vitality to restrain such morbid and spontaneous changes, than animal food in a solid form. During the period of our being awake, the stomach should have a supply of food, at least every six hours ;

of iron dissolved very small, the artificial Spa water, as prepared by Mr. Paul, seems preferable even to any natural chalybeate.—For an account of this and various other waters which are prepared by Mr. Paul in a way far superior to any thing of the kind before attempted, *See the Report made by a Committee of the National Institute of France, &c. on the subject.*—London, 1802.

the quantity, in that case, would be more moderate at any one time, and would be proportioned to the demand of the system: the supply should be regular. Nor is there any good foundation for diversifying our meals; so that breakfast and dinner should be made up of different kinds of food. The secretion of bile would be thereby more regular, and the quality better preserved under such a regimen. A stomach, vitiated by bad habits, is with difficulty reformed, but may ultimately be reconciled to simple and healthy aliment. There are some stomachs which reject milk when it has been medicinally recommended; but they are generally those to which milk has

been a perfect stranger ; and in that, as in similar cases, small repeated quantities of it, taken without the mixture of any other kind of food, have reconciled the stomach to any larger quantity which may be thought necessary. It frequently disagrees with those stomachs in which morbid acidity prevails ; and accordingly I have often found the addition of fifteen or twenty drops of the Aqua Kali puri, considerably lessen, or entirely remove, the inconvenience experienced from taking milk. The condition of the gastric fluid and the action of the stomach, accommodate themselves to that regimen, to which the organ has been accustomed.

7. THERE are some stomachs which

are quick and powerful in finishing the process of digestion, and may require a greater and more frequent supply of aliment than others, whose powers are more limited; but in no case, should the stomach ever be perfectly empty. A sense of uneasiness and acute pain has proceeded from mere emptiness, under which, perhaps, the stomach may be said to feed upon itself: this occurs very frequently in delicate females; who, either from caprice or fashion, take in very small quantities of food at any one time, and yet whose meals are not more frequent than others of a more vigorous constitution. In such cases a meat breakfast, and a luncheon at noon, will prove the best remedies.

I believe that chlorosis, atrophy, tubercle, and other glandular affections, would be best obviated by such a regimen, and females acquire more vigorous and active health by a plan like that now recommended. With respect to the quality of our different meals, we seem to depart more from the custom of our hardy ancestors, with regard to breakfast, than any other meal. A maid of honor at the court of queen Elizabeth, breakfasted upon beef, and drank ale after it; while the sportsman, and even the day-labourer now, frequently breakfast upon tea.

A very leading symptom of a weak stomach, and an enervated constitution, is, the loathing of food at breakfast;

while a vigorous stomach discovers more energy in the morning than at any other time of the day. Digestion is best promoted by a state of rest after eating; and exercise of the body is best adapted to restoring energy, and promoting the necessary secretions afterwards.

Dr. Harwood, the Professor of Anatomy at Cambridge, took two pointers equally hungry, and equally well fed; the one he suffered to lie quiet after his meal, and the other he kept for above two hours in constant exercise. On returning home, he had them both killed. In the stomach of the dog that was quiet, and asleep, all the food was digested: but in the stomach of the

other dog, that process was scarcely begun.

We may observe farther, that the stomach, in its office of digestion, may derive assistance from the liver, by the latter counteracting some of those effects which arise from the diseased action of the former.

We know that when the powers of the stomach have been weakened, and when the digestive process consequently proceeds but slowly and imperfectly, there is often a considerable tendency to *acescency* in the different parts of the primæ viæ. Different portions of the aliment taken in, have a tendency to run into the acetous fermentation, when assisted by heat and moisture.

Thus we find many of the vegetables which we use in diet are digested with difficulty, and are very apt, in bad stomachs, to occasion symptoms of acidity. Flatulence and distention frequently succeed the taking of these substances into the stomach; and the gasses sent out from the mouth, serve as an indication of what is going forward within. Cabbages, cauliflowers, peas, beans, and the different farinaceous vegetables, are apt to produce this effect; whilst those substances which have no direct tendency to acescency, may yet prove an indirect cause of it, by weakening the tone of the stomach, and thus disturbing the digestive and assimilating functions.

But there seems to be a power in a

healthy stomach, of counteracting those spontaneous changes which would take place out of the stomach, or in a diseased stomach. It is not, perhaps, too much to expect from a vigorous stomach, that it should convert into good nutriment, every thing which contains materials capable of forming a healthy chyle. Its powers may probably extend much farther than any trial yet made has discovered; and many substances, which custom has not yet introduced as articles of diet, may be very well managed by this organ. We find that it is capable of assimilating some substances which are various and heterogeneous; and, therefore, it is fair to conclude,

that it is equally capable of acting upon some which are more simple.

If, then, the stomach possesses a power, when in a healthy state, of counteracting the spontaneous changes which would take place in some substances out of the body, and will even prevent acescency in those which are disposed to produce it, if acescency does prevail, we must conclude, that it is owing to some diminution of the powers of the stomach. The question then to be answered, is, “ Can the liver contribute any thing towards the prevention of such an effect as this ? ”

It has been already proved, in the course of those experiments which have been before related, that there is in bile

a refinous substance, in which reside the colouring principle and bitter taste. This bitter, resembling the vegetable bitter, has probably properties in common with that, and is capable of resisting the fermentation going on in the stomach, and alimentary canal, when any of its contents are disposed to run into this state. When it comes into contact with these substances, it may act as a chemical agent, and produce such a change upon them, as shall prevent that process to which they are disposed.

That this is the effect of the vegetable bitter on other occasions, constant experience evinces, in the use of hops, by the addition of which, malt infusions, that would otherwise quickly become

four, are for a long time prevented from running into the acetous fermentation.

The alkali, which is discovered as a constituent part of the bile, may serve to neutralize the acedent matter when it prevails in too high a degree; and thus prevent any mischievous effects, which might arise from its continuance in that state, during its passage through other parts of the system. We are to remember, that if this change does not take place till after the food has passed from the stomach into the duodenum, it may still, in a secondary way, operate upon the stomach, upon that principle of sympathy which we have before referred to, as subsisting between different parts of the alimentary canal, or between

the stomach and duodenum, or other small intestines.

But not only to this acescent state of the contents of the *primæ viæ*, but also to that of *putrescency*, the bile offers a proper corrective. The foregoing experiments serve to prove the greater power which bile has of resisting putrefaction than the blood. Without referring, at present, to the relative disposition to putrescency betwixt the two fluids, we may remark, that if the bitter property of bile have this tendency, this is a circumstance which at once explains the effect referred to. But when we also consider, that to preserve the general tone and vigour of the system, is the best mode of obviating putrescency,

we may still more certainly attribute this effect to the bile, which, both by its immediate influence on the intestine, and its more remote influence on the general system through the medium of the stomach, will very powerfully contribute towards that tone and vigour.

6. THE temporary defect of bile may be supplied by various bitters, occasionally united with rhubarb, aloes, and the like. The excess of acidity may be corrected by alkaline remedies. In infants, the bile is frequently not sufficiently active, and is generally secreted in too small a quantity; hence the diseases affecting their primæ viæ are chiefly those depending upon morbid acidity.

7. IN cases of diseased structure of the liver, producing a diminution of secretion, and particularly when such change of structure has arisen from inflammation, mercury has been found useful, even carried to the degree of producing a slight salivation; moderating the violence, however, of its operation, by plentiful dilution with gum arabic and other vegetable demulcents.

In many cases where the liver and other abdominal viscera have been diseased, and in cases of glandular and mesenteric affection, attended with pain and tension, and even symptoms of hectic fever, I have seen advantages from tepid bathing; the temperature of the water being 90 degrees of Fahren-

heit's thermometer. The practice of tepid bathing may accompany the use of mercury, and may moderate the dangerous excitement which sometimes arises from it.

8. SEA sickness, and a sea voyage, contribute very much to restore the secretion of healthy bile, so necessary to the welfare of the animal economy; and as they do this with much less injury to the stomach than any nauseating or emetic remedies, they may be had recourse to in cases where such remedies would be of doubtful or hazardous use. The symptoms of dyspepsia and diminished secretion, which are now rendered more conspicuous among females from their sedentary life, are

most effectually removed by the means already suggested.

9. IN some cases, the resistance to the secretion of bile may arise from the viscosity of the fluid obstructing the extremities of the common duct as it enters the duodenum: this will be removed most effectually by calomel, scammony, or jalap, which seem in their operation to stimulate and evacuate the duodenum; while many other purgatives act most forcibly on the large intestines.

10. IN the infantile fever of children, so well described by Dr. Butter, a bilious diarrhœa comes on, which proves salutary and critical, and should be encouraged by a solution of sal. polychrest.

in water, and sometimes by the occasional use of calomel and scammony, especially in the early stage of the disease.

11. THERE seems much sympathy between the brain and the liver; and in maniacal persons, in whom there is generally a defect in the secretion of bile; this evil is best removed by the means already recommended.

12. THE complaint known under the name of the *sick head-ach*, is very commonly referred to the presence of bile in the stomach, as its cause; and in this opinion I was led to concur, by patients dwelling very much upon the circumstance of their frequently vomiting bile in the course of the fit. From an accurate investigation, however, of

the symptoms throughout the progress of an attack, I am now satisfied that the presence of bile in the stomach is *not* the cause; on the contrary, that whenever vomiting takes place, either spontaneously or by the aid of emetics, the matter thrown up in the first instance is remarkably acid; and that if, by the violence of the straining, bile is at last forced into the duodenum and stomach, the termination of the paroxysm is much more speedy and complete, than when this does not happen. That acidity equally prevails in those cases where its presence is not demonstrated by vomiting, may be inferred, from the great relief which patients labouring under sick head-ach generally receive from

the use of antacids, and particularly the Volatile Alkali, which at the same time that it stimulates the stomach, is more powerful than the others in neutralizing acid.

My idea then, with respect to this disorder in general, is,—that in consequence of a spasmodic constriction taking place upon the orifice of the *ductus communis choledochus*, bile is prevented from getting into the duodenum. In consequence of that intestine being thus deprived of its natural and customary stimulus, it falls into an atonic state, in which the stomach immediately sympathizes, and either secretes a morbid acid, or by secreting a gastric liquor deficient in quantity or quality, allows the food

which it contains to run into the acid fermentation.

What it is that occasions this spasmodic constriction upon the *ductus communis*, I do not pretend in every case to say; the facts I have mentioned sufficiently prove its existence, and are corroborated by the method of cure which is most successful. The constriction may primarily arise from some constitutional disposition to spasm in the duct itself, or in the intestinal canal at large, as we see in hysteric females. Atony (as Hoffman has long since justly remarked), is the parent of spasm; and whatever induces sudden atony in the *primæ viæ*, and especially in the stomach, will seldom fail in such persons,

to be succeeded by the spasmodic constriction in question, which accordingly depresses the tone of the stomach still farther, and by so doing affects the head: hence we can explain why a sudden piece of bad news, not only takes away appetite, but is often followed by sick head-ach. If the tone of the stomach be diminished in any other way, as by taking in food which it cannot readily digest, the same effect will often ensue; and this is observed to happen more especially when the food is either acid, or of a kind that is much disposed to become spontaneously so. The sympathy between the stomach and other important organs of the body, is well known; and I have

observed this in a very evident way between the stomach and liver. Whenever, either from an irregular distribution of nervous energy, to which certain constitutions are particularly liable, or from the operation of indigestible and acedcent food, the tone of the stomach falls below the degree necessary to the chylopoietic process, the liver immediately sympathizes with it, and bile is no longer emulged into the duodenum. The consequence of this is, that the general feeling of langour and uneasiness which take place from want of action in the stomach, is farther aggravated by the acid state of its contents, and most severe and depressing head-ach supervenes. In this way, then, from

the consent between the stomach and liver, the atonic state which began in the former, is reflected back upon it again with additional force ; and an indisposition which would otherwise have been inconsiderable and of very short duration, is increased to a degree of agony which suspends all exertion both of body and mind, and often continues for two or three days.

13. THE view which I have here given of this disease, does not at all affect the practice I formerly recommended, which was, the drinking half a pint of warm water at bed time ; for it is obvious, that whether the morbid irritation be from bile or from acidity in the stomach, dilution will be one mode

of lessening its effect. Nay it will explain even better than the other, the reason why a *warm* diluent is especially useful in such cases, viz. that by its acting as a tepid bath upon the stomach and neighbouring parts, it more effectually tends to remove the spasm upon the *ductus communis*, and bring into the duodenum that supply of bile which is necessary to prevent the effects already mentioned.

14. THE principles here laid down also serve to account for the benefit experienced from certain remedies, the employment of which was not easily reconcileable with their general effects in cases where there is an increased secretion of bile; of this kind emetics

more especially are, which have often put an end to the paroxysm of sick head-ach, after soothing, stimulating, and antispasmodic remedies had all been tried in turn without relief (12). As vomiting, however, is in itself a morbid action of a very important organ, it ought not to be recurred to frequently, lest we should weaken the tone of the stomach, and finally aggravate rather than lessen the complaint we wish to remove. It should therefore be had recourse to only in the more severe forms of sick head-ach, which resists the other remedies mentioned; and then it should be excited by such medicines as are least debilitating in their operation; such as the Vitriolated Zinc,

taken in the quantity of a scruple or half a drachm, in a cup-full of warm water. Where the stomach (as sometimes happens) is very torpid, perhaps the mustard vomit might be preferable. But whatever be the article, the benefit derived from it will in general be proportioned to its effect in emulging the liver of its bile.

15. WHEN this disease is constitutional, and, as I have sometimes seen it, hereditary, it will frequently be found to resist every means that can be tried for its entire removal, and often to be little affected by any thing taken to shorten or alleviate the fit when it has come on. In such cases the utmost attention should be paid to diet, by

avoiding all indigestible, acid, or fermentable articles, drinking the artificial mild Seltzer water instead of malt liquor, keeping the bowels regularly open by small doses of rhubarb with natron, and promoting the circulation through the hepatic system, as well as mechanically assisting the discharge of bile by riding on horseback: and by a steady adherence to this plan, both the frequency and violence of the complaint have been very much diminished.

C H A P. III.

OF OBSTRUCTION TO THE FREE
PASSAGE OF BILE INTO THE
DUODENUM,

S E C T. I.

IF, after bile is secreted, its free admission into the duodenum be impeded, so that an accumulation of it take place in the excretory ducts of the liver, it either regurgitates into the habit by the hepatic veins, or is absorbed by the lymphatic system; in either case it produces the disease called JAUNDICE; the

history and cure of which I shall now endeavour to explain.

2. JAUNDICE may be defined—a yellow colour of the skin, and tunica conjunctiva of the eye, with urine of an obscure red, tinging linen with a yellow hue; and with the fæces generally of a light and clay-like appearance in consistence and colour.

3. THIS is a disease to which women are more subject than men, and adults than children; though it takes place occasionally in persons of both sexes and of all ages. It is attended with a sense of lassitude and languor, a feeling of pain and tension, or weight and oppression about the præcordia; there is frequently much anxiety, and some

degree of difficulty in breathing. The eyes and roots of the nails first become yellow, afterwards the whole body; which is also sometimes attended by an itching of the skin.—The disease is also accompanied with nausea, vomiting, flatulency, acidity, and indigestion; and the fæces, which are commonly of a white colour, have not the usual fæculent smell. Solid food generally tastes bitter in the mouth in some; and in the most unfavourable state of the disease, there occurs hiccup, and occasional paroxysms of rigor, or chilliness. The pain is sometimes extremely acute in the right hypochondrium, or in the epigastrium. The state of the pulse varies; in general it is quicker than

natural, though in some cases, especially during the passage of a gall-stone, it is flower. It very seldom or never happens, that objects appear to the patient of a yellow colour.

4. THIS disease is frequent during pregnancy, and in early infancy; in both, however, it is of a very short duration.

5. ITS decline is marked by a gradual diminution of the sense of weight, oppression, or uneasiness about the præcordia; a return of appetite and digestion; the urine becomes of a more dilute colour, and is secreted in a larger quantity; the stools acquire a yellow colour, are more copious, and more

easily procured; sometimes hard and concrete matter is found in the fæces.

6. IT is a disease into which a patient is very liable to relapse. It is very unfavourable if the pain be violent, and attended with a quick pulse, loss both of strength and flesh, with occasional chilliness, watchfulness, and melancholy; under those circumstances, he becomes subject either to profuse sweating or hæmorrhagy. When these symptoms attend it, the disease frequently terminates in a confirmed ascites.

7. UNDER such circumstances we may conclude, that though some bile must be secreted, and that its regurgitation or absorption is the consequence of some resistance to its free ingress into

the duodenum ; yet that a part of the liver is, in its structure, or organization, materially diseased ; a circumstance which, though frequently attendant on jaundice, is by no means necessary to constitute the disease.

8. ON dissection, various appearances present themselves to our notice. The brain, the bones, and even the cartilages, are found deeply tinged of a yellow colour. The *pori biliarii*, and some of the larger branches of the hepatic ducts, are found sometimes obliterated by diseased structure. Gall-stones are often found in the *ductus communis*, but more frequently in the gall-bladder and cystic duct. In some a thickening and diseased structure of the *ductus*

communis has taken place, not unlike what has been observed in the œsophagus or urethra. In many cases there have been appearances of mechanical pressure from the distention and tumour of surrounding and neighbouring parts, as of the pancreas, duodenum, and colon, either of a temporary or permanent nature; hence a jaundice may arise from pressure during pregnancy. The bile has been found of a very viscid, and pitchy consistence, especially in the gall-bladder; passing from the cystic to the common duct, and thereby perhaps resisting the passage of the more fluid hepatic bile, which would otherwise flow freely into the duodenum.

9. THE *chlorosis*, to which young

women are extremely subject, puts on, to a superficial observer, the appearance of jaundice. In the chlorosis, the tunica conjunctiva is not more discoloured than any other part of the body, and the urine is not of a deep colour, but rather pale and limpid.—I am persuaded, however, that in chlorotic habits the bile is more insipid, is secreted in less quantity, and of a paler colour than in health. This imperfect state is, perhaps, in common to all the other secretions of chlorotic subjects, and may possibly arise from the watery state of the blood, the paucity of red particles, and the defective energy of the whole system.

10. IN the endemic fever of the West Indies, in which the skin is obviously

tinged with bile, there seems rather a redundancy of it in the primæ viæ, than a deficiency. Perhaps the quantity of bile which is secreted is so very considerable, that though the greatest part of it escapes into the primæ viæ, the whole may not readily find a passage; and the surcharge thus occasioned may give rise to regurgitation and absorption. The reason for this may probably be, that the diameter of the common duct, or of the larger branches of the *pori biliarii*, though fully adequate to transmit the whole of the bile secreted in the healthy state of the liver, yet may be insufficient to convey the excess produced under a hurried action of that organ; and therefore, with every appearance of a large supply of bile in the

primæ viæ, a jaundicé may take place. This is usually the case in the slight jaundice to which infants are liable ; and has been farther proved by direct experiment. M. Portal passed a ligature round the intestine of dogs, a little below the opening of the ductus communis choledochus, and observed, that in five or six hours after, the tunica conjunctiva of their eyes acquired a yellow tinge, and upon examining the lacteals, he found them filled with bile. —*Mem. de l'Acad. des Sciences, Année. 1777.*

II. THE symptoms of pyrexia, and other phenomena of febrile miasmata acting on the body under the endemic yellow fever, together with the delirium, the quick prostration of strength

after early symptoms of local inflammation, either in the duodenum, or region of the biliary ducts, distinguish it very readily from jaundice.

12. THE secretory economy of the liver, in common with that of most other organs in the body, is very much influenced by the passions. Anger, it is well known, produces strongly marked effects; it not only augments the quantity of bile secreted very considerably, but likewise vitiates it: hence it is, that by being carried into the duodenum in large quantities, and thence regurgitated into the stomach, it produces the same effects as an emetic.

13. IF the *ductus communis* does not transmit it as fast as it is secreted,

and the gall-bladder is so full that it cannot receive the excess; then it will be forcibly returned upon the hepatic system, and by entering the blood-vessels, produce jaundice.

14. It seldom happens, when a secretion is hurried by the excess of action, that the fluid secreted possesses its natural and healthy properties; hence arises the variation in the appearance of bile, which, in some acute cases, as in cholera morbus, I have seen of a colour as black as soot, so as to resemble more the red particles of the blood, in a broken or diseased state, than the bile. Such a fluid may be considered as something between blood and bile; and carried off so quickly, that the process

of making bile had only just begun, though the change in the condition of the blood with a view to that process, had taken place. This could not have depended on any diseased structure, for it is instantly removed by opiates and other means which may restrain immoderate action.

15. MEN engaged in literary pursuits, and women, from leading sedentary lives, are very much disposed to jaundice and other diseases of the abdominal viscera; for the excretory powers of the liver depend but little upon any action which the biliary ducts can perform, as they possess a very small degree of irritability; but are assisted principally by the agency of the dia-

phragm, and abdominal muscles, and the peristaltic motion of the intestines ; and more especially from the agitation which the hepatic system suffers during bodily exercise. The want therefore of a degree of exercise sufficient to assist the biliary ducts in their excretory function, must necessarily lay an ample foundation for morbid affections. And the necessity of this external aid to the perfect action the liver, seems more obvious from the circumstances of its venous circulation, which is always more languid than in those secretory organs where the fluids are kept in a state of more rapid motion by arterial impulse. Horse exercise seems peculiarly well calculated to assist the action

of the abdominal viscera, in cases of defective excitement in the hepatic system.

16. THE bile, during its stay in the gall-bladder, acquires a viscid consistence; perhaps, in some measure, from the absorption of its more aqueous parts, and likewise from a propensity to spontaneous separation, by which its coagulable part may detach itself. Though this circumstance is less obvious in bile than in blood, and though it may require more time to be effected, yet I think it probable, from analogy, that such a separation of its parts may take place.

17. IN many cases we find the abuse of spirituous liquors disposes to jaundice;

and evidently of the most unfavourable kind, because generally accompanied with diseased structure. They may act by first altering the structure of the stomach and duodenum, and afterwards, by sympathy of contiguity, affect the biliary ducts of the liver. In the dissection of those who have been intemperate dram-drinkers, the diseased structure may be traced from the stomach along the course of the ductus communis, and I have frequently seen these ducts so contracted and thickened, that they could not transmit bile.*

* I was informed by the late Mr. Hunter, that the stomachs of dram-drinkers are generally found in a flabby and inelastic state, capable of secreting only diseased fluids: this loss of tone in the stomach is followed by

18. HOWEVER remotely situated some parts of the body may be from others; yet a diseased action is quickly propagated to a distance, without affecting intermediate parts; and it frequently happens, that an attempt to cure the disease of a part, is followed only by its removal to some other organ of the body: hence the suppression of issues, cutaneous eruptions, and hæmorrhoids,

frequent vomiting, tremulous motions of the muscles, propensity to palsy, and loss of memory.—In many cases, as has been already observed, the liver is so far diseased that it does not even secrete bile, and a pallid and unhealthy aspect takes place.

The urine is secreted in a small quantity, and of a deep colour, though not tinging linen of a yellow hue. This is frequently a more dangerous state of disease than jaundice, which indicates only a resistance to the passage of bile into the duodenum, and may take place in the most healthy state of the liver.

are followed, in some cases, by morbid affections of the lungs, in others, of the hepatic system; and these do not always subside on restoring the diseased action to the organ first affected. In confirmation of this opinion, I have seen a jaundice with a sense of pain and oppression on the right hypochondrium, correspond and alternate with piles, and with habitual discharges of pus from ulcers in the lower extremities.

19. IT is generally admitted, and I think sufficiently proved by some experiments already mentioned, that the biliary ducts are very passive, and that they submit very easily to mechanical distension from calculi, without contracting afterwards like sensible or irri-

table parts; therefore when jaundice has arisen from very acrid emetics, or griping purgatives, or cholic, or hysteria, the resistance to the free passage of bile is either at the very extremity of the *ductus communis*, or during its oblique course through the substance of the duodenum, at which part it is liable to compression from the muscular action of that intestine: perhaps, likewise, the increase of the quantity of bile in the intestine, may depend on an action communicated to the *ductus communis*. In the one case, the duct may be closed; in the other, it may be acted upon by successive motions, by which it emulges more quickly its contents.

20. WHEN we were treating of the natural and chemical history of the bile, we annexed some observations on the appearances and component parts of biliary calculi, which will supersede the necessity of a repetition of them in this place. It will be proper here, however, to remark, that such concretions do not occur in every part of the biliary system with equal frequency; from dissection it appears, that they very rarely exist in the hepatic ducts; sometimes they are met with in the *ductus communis*, more frequently in the *ductus cysticus*, and are most common in the gall-bladder. The bile accompanying them is more viscid than usual, and ap-

pears to contain a larger portion of the colouring and bitter principles.

21. THE number and size of these calculi vary much: sometimes the gall-bladder is filled with them, at others there are not more than one or two; sometimes they are small and angular, at others large, and have a more regular surface. I have seen a gall-stone nearly the size and figure of the gall-bladder itself, so as almost to fill the whole cavity. These large concretions are less frequently the cause of jaundice than smaller ones; for, from their bulk, there is but little probability of their entering the ductus cysticus, and afterwards of obstructing the ductus communis. It is from calculi of smaller

dimensions that such obstructions generally arise. However, the rule is not without exceptions, and from dissection it appears, that calculi of considerable bulk must have passed; for the *ductus communis* has been found enlarged to an inch in diameter: an instance of which has been met with by Dr. Heberden.

22. BUT calculi have passed, during life, of such a bulk as to occasion a doubt whether they escaped into the intestines by the natural canals, or made their way thither by a preternatural passage. Dr. Cheston, some years ago, met with a case where a gall-stone of an unusual magnitude passed during life, and the patient got well. Some years

after she died of another complaint, and on examination it appeared that this large gall-stone had made a preternatural passage through the gall-bladder into the intestine. Mr. Cline, in his excellent collection of anatomical preparations at St. Thomas's Hospital, has an instance of a case of this kind.

23. A PERMANENT jaundice has frequently arisen from surrounding tumours compressing the hepatic ducts: a scirrous enlargement of the pancreas, has sometimes produced this effect. Excessive vomiting, and violent exercise, perhaps by forcing stones from the gall-bladder into the cystic duct, and from thence into the common duct, have produced the disease. There is an

instance where jaundice arose from the seeds of gooseberries being found in the extremity of the *ductus communis* as it enters the duodenum. In short, whatever can obstruct or impede the passage of the bile into the duodenum, must be considered as a cause sufficient to produce jaundice : but in what way the bile passes from the biliary vessels into the general circulation, has already been explained in the physiological part of this work.

24. THE jaundice, when arising from a diseased state of the structure of the liver, or from the tumour of surrounding parts, and more especially if accompanied with fever and gradual diminution of strength and flesh, is seldom

cured, and generally terminates in ascites.

25. IF, on the other hand, it has arisen suddenly in young and vigorous habits (though accompanied even with much pain), unattended with fever and the other unfavourable circumstances above remarked, it is seldom of long duration, and by a judicious treatment may be effectually removed.

26. THE *cure of jaundice* consists in the removal of exciting causes, and in alleviating urgent symptoms. Calculi are the most frequent exciting causes.

27. IT appears from experiments, that some calculi are soluble in an alkali, in spirit of wine, and oil of turpentine; but it is altogether impracticable to

make a direct application of those substances to calculi in the biliary ducts; as we have no facts to prove, that by the course of circulation, they can be carried into the gall-bladder so little changed as to preserve any sensible degree of power.*

28. IT remains yet to be proved, that the proportion of alkali in the bile is increased by alkaline remedies. Many saline remedies pass into the urine un-

* With respect to alcohol, æther, and oil of turpentine, and more especially the two first, there is certainly no proof that they can arrive at the gall-bladder through the medium of the blood. Yet their efficacy is strongly attested by some of the most respectable physicians and chemists in France.—See two papers on this subject by M M. Durande, and Maret, in *Les Nouveaux Memoirs de l'Acad. de Dijon*. tom. 1 & 2.—Also, *L'Hist. de la Societe Roy. de Medicine*, tom. 3.—And a further account by M. Durande, in a volume of Observations published by him at Strasburgh, in 1790.

changed, and may act on calculi in the bladder; but it is more difficult to detect the presence of alkaline or other solvents in the bile. If we cannot, however, ascertain that the bile contains more alkali after the use of carbonate of soda, than it did before, it is because we cannot obtain the bile as it issues from the liver, to make the necessary experiments for that purpose. But, that alkaline salts, and especially the fossil alkali, may and do find their way thither, appears as demonstrable, as any thing founded on reason and analogy can be. It has been shewn, that fossil alkali forms a constituent part of bile; the blood then, from which the bile is secreted, must contain either the ele-

ments of this salt, or the salt itself in its formal state. We know with equal certainty, that fossil alkali taken into the stomach, enters the circulating mass. Can we then suppose, that the whole which thus enters the blood passes off by the kidneys; and that none of it finds its way to a secretion of which it naturally constitutes an essential part? But the argument does not rest upon analogy only; it is reduced to a question of fact. Among the various remedies employed against biliary concretions, there are none which have been nearly so successful as alkalies taken for some continuance; and we must either admit, that, by impregnating the blood, they supply an additional quantity of that

principle upon a defect of which the formation of biliary calculi depends, and thereby render the bile not only less disposed to concrete, but even capable of softening and dissolving concretions already formed; or, we must attribute their beneficial effects to some occult quality that is equally repugnant to the knowledge which we possess on the subject, and to the genuine spirit of sound philosophy.

29. THE passage of gall-stones may be promoted by gentle vomits, and for this purpose ipecacuanha is frequently given; but its action will be assisted, if it be exhibited in small doses, and divided so as to occasion, for a time, a degree of nausea, but, ultimately, to produce the full effect

of an emetic. Tartarised antimony, as producing a much greater degree of muscular relaxation than ipecacuanha, and, on ordinary occasions, a more complete evacuation of the liver and gall-bladder, may be preferable. For the same reason tobacco deserves a trial ; as the sickness which it occasions resembles sea-sickness more than any other : and it is probably on this principle, that sea-sickness has been so very efficacious in those cases.

30. THE duodenum may be stimulated by calomel combined with scammony or rhubarb ; and in cases of a defect of bile in the intestinal canal, the deficiency may be supplied by a purgative bitter, such as an infusion of camo-

mile flowers with tinct. aloes,—or colom-
 lombia with rhubarb and soap,—or vitri-
 olated kali with infusion of rhubarb.
 In cases of violent pain, with a slow
 pulse, opiates and tepid bathing may
 be recommended: and where there is
 pyrexia, with local pain and dyspnoea,
 blood-letting and the antiphlogistic re-
 gimen are proper.

31. GENTLE exercise on horseback
 is particularly useful in promoting the
 passage of calculi, and preventing the
 stagnation of bile in the gall-bladder;
 which unquestionably renders it viscid,
 and thereby liable to stop up the passage
 into the duodenum.

32. IN jaundice from tumour or
 other pressure of surrounding parts, small

doses of calomel, or some other mercurial preparation may be useful, unless symptomatic fever should take place, in which case mercury does harm. Chalybeate waters may be used to advantage, with a view of giving that tone and energy to the system, so very defective in cases of jaundice.*

* Dr. Dick, a gentleman high in the medical profession in Bengal, and of much practice in Calcutta, in a letter to me, says,—“ I have been for the last seven
 “ years in the habit of giving calomel in the jaundice,
 “ in doses from two to five grains every night, till the
 “ mouth was affected, and in every case, the jaundice
 “ went off as soon as the mouth became sore.—I now
 “ scarcely use any other medicine, except merely to
 “ prevent costiveness.—I cured upwards of forty patients
 “ in that way, and all in less than a month, generally
 “ in ten days or a fortnight.” The same gentleman, in a subsequent letter to a friend, after paying many compliments to my Treatise on the Liver, says—“ I
 “ think, however, that Dr. S. has not so high an opinion
 “ of the good effects of mercury in liver complaints, as
 “ it deserves.—I have been confirmed more and more by

“ late practice, in my opinion, of its effects in the jaundice, though I do not attempt to reason upon it.

“ In recent attacks of liver complaints, after early bleeding, blistering, and the free use of laxatives, I never saw a case where suppuration came on if mercury were freely used, and continued till the mouth was sore; and, if I be not much mistaken, it is in such cases, that it has the best effects.—In chronic cases, where there is no fever, but only an obtuse pain in the side and shoulder, with a fullness in the side, and about the pit of the stomach, keeping up a constant uneasiness, mercury seems to me to have but little good effects: when used freely it removes the symptoms at the time, but they generally return as soon as the mercury is left off. Having been repeatedly baffled in this way, and observing very often that such liver attacks succeeded long courses of mercury, undergone for the cure of venereal complaints, I have, for several years past, trusted to a seton or issue made in the side, and with success far beyond my expectations.”

These being the remarks of a gentleman of much practice and observation, I have given them in his own words, being convinced that they deserve the particular attention of those who practice in India.

C H A P. IV.

OF THE DISEASES TO WHICH THE
LIVER IS SUBJECT IN COMMON
WITH OTHER ORGANS OF A
GLANDULAR STRUCTURE.

S E C T. I.

THE liver is susceptible both of acute and chronic inflammation ; perhaps of the former, as being more immediately connected with its arterial or nutrient, the latter with its venous or secretory, system. When the liver is seized with

acute inflammation, the disease is called Hepatitis.

2. It is generally preceded by some degree of *horripilatio* and *rigor*, which in some cases, however, are so slight as to evade the attention or recollection of the patient ; to these succeed an increase of heat, and quickness of pulse. The pain in the right *hypochondrium*, or region of the liver, is very acute, attended with difficult and painful respiration, great watchfulness, and occasional delirium. The patient lies with more ease on the right side. The urine is secreted in small quantity, is high coloured, and frequently tinged with bile. The tongue is generally covered with a white crust, and, together with the mouth and *fauces*,

is extremely dry. These are the leading symptoms of Hepatitis.

3. THE symptoms are somewhat varied, according to the particular part of the liver which may happen to be the seat of the disease. If the inflammation attack the convex surface of the liver, so that the peritoneum becomes affected, the pain is much increased by external pressure, and some degree of tumour may be observed. If that part of the organ be diseased which is more immediately contiguous to the diaphragm, it gives rise to difficult and painful respiration, dry and frequent cough, acute shooting pains in the thorax, extending to the humerus, clavicle, and scapula, chiefly of the affected side.

4. THESE symptoms, from the resemblance they bear to those of pleurisy, peripneumony, and other inflammatory affections of the chest, are apt to mislead an unwary practitioner ; but are to be distinguished from them by an attention to the history and progress of the complaint.

5. IN some cases of Hepatitis, the stomach is so extremely irritable, that violent retching or vomiting occur ; symptoms occasioned, perhaps, by the inflammation being in the vicinity of that organ. In most cases the secretion of bile is increased under active inflammation, though its passage into the *duodenum* is frequently impeded ; so that

jaundice is no uncommon symptom of this disease.

6. IF the symptoms of *fever* and local pain continue to increase rapidly for a few days, a suppuration takes place; a large quantity of pus is formed, the external tumor becomes more prominent, and a fluctuation may be perceived, so as successfully to direct the surgeon to the safest place for an artificial opening by the lancet, or by caustic. During the formation of pus, frequent rigors take place, and a sense of weight and oppression succeeds that of acute pain.

7. IT frequently happens, that *pus* is formed either in the vicinity of the *ducts*, or the concave part of the liver;

so that no external tumor can be perceived. The usual symptoms of suppuration, however, may be observed in all cases where matter is produced; and if the outlet to it be free and open by the intestines, the patient frequently recovers, even after being much emaciated, and under appearances extremely unpromising. If again, on the other hand, the pus is discharged either through the *diaphragm* into the cavity of the thorax, or more directly into that of the abdomen, the disease generally proves fatal.

8. WITH respect to the manner in which the discharge is effected in those cases where it passes off by the intestines, it must be clear, that some of the

branches of the hepatic duct are involved in the suppuration, and consequently destroyed by the ulcerative process.

9. WE should then naturally expect, that the pus would insinuate itself into those orifices of the hepatic ducts, which ulceration had formed, and by those channels make its way into the duodenum.—But this explanation is not unattended with difficulty: for it must be recollected, that wherever suppuration and ulceration are going forward, there adhesion is an attendant.

10. IT would be departing from the main object of this work, to enter into an inquiry on the advantages resulting to the machine from this connexion of

inflammatory stages ; as those advantages are as much diversified as the parts which are the seat of inflammation. It is in place here, however, to observe, that an abscess of the liver, in common with that of other parts, has its boundaries circumscribed by the effusion of coagulable lymph, so changed by passing through inflamed vessels, that the parietes of that abscess become folded into a solid compact mass. Thus an abscess which, under contrary circumstances, would have diffused itself to an indefinite extent, now becomes determined and circumscribed.

II. THESE considerations prepare us for a change, which must necessarily be induced on the ulcerated branches of

the hepatic duct ; the coagulable lymph, which is every where poured out upon the internal surface of the abscess, will, in all probability, so obstruct the ulcerated orifices of the biliary ducts, that no pus can make its way through them into the intestines.

12. NOTWITHSTANDING this, I think it very probable, that an abscess may point on the concave surface of the liver, and so far involve the hepatic duct, that it may ulcerate through its coats, and allow the matter to pass into the duodenum. Whether we may be able to distinguish such a case in the living subject, is rather doubtful ; but I should suspect that the discharge of pus by the intestines will then be very gradual, as

the opening of communication is rather small.

13: PERHAPS the most useful evacuation of hepatic abscesses by the intestinal canal, is that where an adhesion taking place between the suppurating part and the intestines, an ulceration ensues, and the contents of the abscess have a ready passage into the intestines. This may happen in different parts of the intestinal canal, according to the situation of the abscess.—When it is seated at the concave part, the duodenum may be favourable for that purpose; but when the lower edge of the liver is the part concerned, the great arch of the colon is the usual outlet; and in these cases it is highly probable,

from the scale of the parts concerned, that the opening of communication will be more extensive, and the discharge of the matter more free.*

15. THE diseases which are mistaken for hepatitis, are, peripneumony, inflammation of the stomach, and rheumatic affections of the muscles in the neighbouring parts.

13. THE hepatitis is less easily distinguished from the peripneumony, when that part of the liver is affected, which is seated within the false ribs, and where

* This view of the complaint accords generally with that of my friend Dr. Cheston, who favoured the world with his thoughts on this subject many years ago, in his publication called *Pathological Inquiries and Observations*; a work not less distinguished for accuracy of observation, than valuable for the judicious remarks it contains.

it enlarges itself in such a direction, as to make a pressure on the diaphragm sufficient to diminish the cavity of the chest: and it is probable, likewise, that from the extension of the inflammation into the substance of that organ, its operation as an instrument of respiration may be much impeded.—Under these circumstances a troublesome cough, with difficulty of breathing, comes on; so that the disease assumes the appearance of thoracic inflammation.

16. IT is more easily distinguished from the inflamed condition of the stomach, by its not being accompanied with that extreme sense of heat and pain with which the organ is affected, especially after taking any thing into it;

nor is the debility of the system so great in the inflammation of the liver as in that of the stomach.

17. IN the case of muscular pain, there is little or no fever; the pain is more diffused, is frequently removing from place to place, and is more influenced by varying the posture of the body: it generally alternates with rheumatic pain in one or more joints of the body.

18. WHEN the hepatitis terminates spontaneously and favourably, there is some evacuation by hæmorrhagy, diarrhœa, perspiration, or a copious sediment in the urine. In some cases I have seen a great increase of bronchial secretion accompanying the resolution of

this disease; and it is not improbable, but that a superficial discharge of coagulable lymph may promote this resolution, though afterwards productive of adhesive inflammation.

19. IT has frequently happened, that a large abscess has very quickly formed, which, either by corroding the large blood-vessels, or by effusing pus into the general cavity of the abdomen, has proved fatal.

20. SYMPTOMS indicating the formation of matter in the substance of the liver, have sometimes suddenly ceased; so that either a translocation of the disease to some other organ has taken place, or the pus has been quickly absorbed, and been discharged by urine.

21. THE period of suppuration varies according to the degree of inflammation, temperament of the patient, nature of the climate, season of the year, or the means of cure which have been adopted.

22. THE symptoms of suppuration are not always, however, very obvious ; the most striking of them are, a diminution of pain, a sense of pulsation and of weight in the right hypochondrium, especially when lying on the left side ; frequent rigors, an accession of fever towards evening, with flushings of the countenance, a propensity to profuse sweating, and other symptoms of hectic fever. In many cases the fluctuation is very apparent. I have seen some instances where the pain and inflamma-

tion have subsided very suddenly, and have been succeeded by a low, fluttering pulse, cold extremities, delirium, and death: so that there has been reason to suspect, that this organ may, on some occasions, though much less frequently than others, become gangrenous.

23. THE hepatitis frequently terminates in the enlarged and scirrhus state of the organ; and we may observe, on the inspection of dead bodies, such a variety in the appearances, as to suggest the idea of different kinds of scirrhus affection, which will be best explained by attending to the progress of chronic inflammation in the liver; to which species it is more subject than to the

acute. It is indeed sufficiently evident from dissection, that the liver is subject to inflammation which did not obviously appear from any prevailing symptom before death: though, perhaps, a more accurate attention to circumstances might have ascertained the disease.*

24. FROM repeated observation I am induced to believe, that the chronic inflammation of the liver is frequently mistaken for a dyspeptic state of the stomach. And I have seen many cases of this kind, which have been supposed to arise from indigestion. The patient generally complains of pain, which he

* For a more particular account of the diseased structure of the liver, the reader may consult the *Morbid Anatomy of the Human Body*, by Dr. Baillie; a most excellent and useful book.

falsely attributes to the stomach; and its continuance is so short, and the degree of it frequently so inconsiderable, that no alarm respecting the future health of the patient is produced. The relief obtained by eructation and discharge of air, tends to confirm the opinion that the seat of the disease is in the stomach; but this relief may be explained on the principle of removing the distention of the stomach, and so taking off the pressure of this organ from that which we think is the seat of the complaint. I believe from experience, that an attention to the following circumstances will enable us with some certainty to distinguish the disease.

25. IN those cases where the liver is

affected, considerable pain is felt in the parts near the scrobiculus cordis and epigastric region, upon any degree of pressure; and as the disease advances, an increase of heat, a quickness of pulse, and other symptoms of fever, are observed, especially towards night. The patient will sometimes derive relief from bleeding at the arm; and the blood, when drawn, will put on those appearances which are common to febrile complaints, and disorders of an inflammatory nature.

26. THE acute inflammation of the liver is an endemic disease in warm climates, more particularly in the East Indies, and very generally terminates in suppuration. When the symptoms

of active inflammation, however, have been checked, though not effectually removed, by the antiphlogistic practice, the disease frequently becomes chronic, and terminates in a scirrhus induration of the organ.

27. ON this subject much information may be obtained by observing the countenance of the patient, which, though not wearing the appearance of jaundice, yet has a peculiar fallowness, expressive of a morbid condition of the liver.

28. THE two complaints are not more distinguished by their symptoms, than they are by the different states of the liver which produce them.

29. IN chronic inflammations, a condition obtains in some degree the reverse

of the former. Instead of appearances which accompany and characterise acute and active inflammation, there are manifest signs of indolence and want of action in the circulating system. The colour natural to this organ in the healthy state, and which appears to be imparted to it by the bile, is lost; it assumes an ash or clay-coloured hue, evidently connected with a diminished secretion.

30. THIS kind of liver is obviously smaller, it undergoes a change of shape; the lower edge, which is naturally thin, especially that of the left lobe, becomes rounded and gibbous.

31. If we cut into this substance, we find uniformly a solid compact ap-

pearance, interspersed with foramina, evidently the orifices of divided vessels; but if we compare the cut surface of a diseased liver with that of a healthy one, we observe a very sensible difference, the latter being much more porous than the former. This morbid and compact state, together with the diminished bulk of this organ, lead us at first view, to a suspicion that the diminished size may be explained on the principle of consolidation of its substance; or, in other words, that it has gained in compactness what it has lost in external bulk.

32. If this explanation were just and adequate, we should find the liver of its natural weight; but observation has evinced that, together with a diminu-

tion of bulk, there is some degree of loss in its weight; evidently proving, that a portion of its solid substance has been removed, and carried into the general mass of fluids, agreeably to a law of the absorbent system.

33. BUT I strongly suspect, that this diminution of substance obtains in different degrees, according to the period or duration of the complaint. In the more early stages of scirrhoty, the liver is not sensibly diminished in its bulk: nay, I am persuaded, that there is, at this period, an increase both of bulk and weight, but that afterwards, there is a gradual diminution of both; and this is nothing more than may be expected,

when we consider the causes that occasion this disease.

34. THESE causes are of a nature which tend to produce a hurried secretion, and consequently an imperfect state of the bile, viz. long residence in a warm climate, and the immoderate use of ardent spirits.

35. BUT, whatever be the remote or occasional causes, it must be evident that the immediate causes can admit but of little variety. To produce an increased secretion of bile, it is plain that there must be an increased action of the branches of the vena portarum, and an acceleration of fluids through those branches: hence a condition of vessels is induced, approaching in some re-

spects to that of inflammation, with this difference, that it is an inflammation in which the vein, or secreting vessel, is more concerned than the artery or nutrient vessel.

36. THE effect of this action, especially when protracted for a considerable time, must necessarily be that of inducing an alteration in the structure of the part; an alteration similar to what obtains in other organs labouring under indolent and chronic inflammation.

37. THIS change of structure, from its solidity and compactness, seems to depend on the effusion of the coagulable lymph into the parenchymatous substance of the liver; with this peculiarity,

that while it is, in active inflammations, deposited by arteries, it is, in the chronic kind, effused by the veins.

38. THUS we are in possession of a cause which appears to explain that diminished secretion of bile usually met with in such cases; in which a hurried or excessive secretion was wont to prevail: but to proceed any further in this train of reasoning, would be to anticipate what we have to propose on the subject of the proximate cause.

39. IF this position just stated be true, it must be admitted as a consequence, that such livers are not performing their full share of that office, to which they were destined by nature.

40. Now we know, by a law of the

absorbent system, that such parts as cease to perform the office which nature intended they should do, are considered as useless bodies, and are fit subjects for the action of these vessels: hence it is, that there is a greater diminution of substance in those scirrhotities which are of long standing, than in such as are of more recent date.

41. To inquire in what consists the proximate cause of inflammation of the liver, is to investigate what is the proximate cause of inflammation in general. The limits prescribed to this work do not allow us to enter extensively into this question, as it would involve an examination of the prevailing theories on this subject.

42. FROM observation we are taught the means that are used with advantage to palliate, and even to remove inflammation ; and from observation likewise we learn, that the same means which are serviceable in one inflammation, are injurious in another : now, admitting the axiom, “ that similar causes produce “ similar effects under similar circumstances,” and finding likewise, that some inflammations are aggravated by the very means which cure others, we infer as a consequence, that the condition of inflamed vessels, or, in other words, the proximate cause of those symptoms denominated inflammation, is not always the same. Hence arises a considerable share of the difficulty at-

tending the investigation of proximate causes in general.

43. THE phenomena of inflammation evidently shew, that in every inflamed part there is a congestion of blood, in a greater or less degree. This is very conspicuous in those parts of the body where, from their situation, we are enabled to see the change of colour, as in the skin; but more especially the tunica conjunctiva of the eye, where, from its transparency, and the white subjacent tunica albuginea, we have an opportunity of seeing clearly the commencement and progress of inflammation.

44. THE first appearance is a distention of some of its vessels, in such a degree as to allow red blood to pass

where serum only was wont to circulate. In the progress of inflammation, more vessels become distended, until at length the whole eye assumes almost one uniform red appearance.

45. Now, on what peculiar state of vessels does this distention depend? Are the powers that act in propelling the blood from the larger vessels to the smaller ones increased, while the resisting powers of the ultimate branches remain the same as in health, “but, from being “originally weaker than those of other “parts, give way to the increased impetus?” Or have the ultimate branches undergone a change of such a nature, as to yield to the ordinary force, or natural *vis a tergo* of the larger vessels?

46. THERE are good reasons for believing, that each of these conditions exists in its turn : at least the methods employed with success to remove inflammations of this part, lead to that opinion. For it is a fact well established in the treatment of these complaints, that the same means which are employed in the cure of one ophthalmia, tend to aggravate another. The means generally employed in these cases, are such as either diminish action or increase tone ; and each plan of treatment is successful in its proper case.

47. Now what has been said of ophthalmia will apply to hepatitis and other inflammations.

The liver may be inflamed in conse-

quence of external injury. In such cases it is probable that a violent and strong action will take place, analogous to what would happen in the eye from the presence of an extraneous body; and that a plan of treatment evidently sedative or antiphlogistic, is most likely to be efficacious in both.

48. ON the other hand, the same organs may be in a state of inflammation without the application of any obvious stimulating cause. In the eye, experience has evinced that this kind of ophthalmia is most successfully treated by bark, and such external applications as tend to stimulate and give tone; evidently showing that the essential character of that inflammation is de-

bility. And further, it is now well understood, that an inflammation of the eye which was of the active kind at its commencement, changes in its progress to a state of debility, and yields only to those means that give tone and strength to the part.

49. It is of importance to our subject to investigate in what way an active inflammation degenerates into an indolent one.

We have said, that in every inflammation, there is some degree of congestion of blood, and consequently distention of vessels: if this congestion be relieved at its commencement, by lessening the distending cause, the vessels, still preserving their tone, readily return to

their original dimensions: but if, on the other hand, the congestion is allowed to remain, and of course the distention of the vessels, their tonic power necessarily becomes diminished, and such means only can avail, as tend to lessen the column of the blood, and increase the contractile power of its vessels.

These reasonings may serve to give some idea of the two states of the vessels as connected with active and indolent inflammation.

50. As the principles laid down apply to inflammations of any organ, we shall endeavour to show, by considering the nature of remote causes, in what way they may produce this state of vessels in hepatitis.

51. MANY remote causes of hepatitis may be enumerated, such as affections of the mind, particularly anger, long protracted summer heat, the intemperate use of spirituous liquors, &c. But to produce the same disease, it is natural to expect that there is one principle of action in common to them all. This principle appears to consist in inducing a state of excitement in the circulation of the liver : and the accelerated, though imperfect, secretion of bile, together with the sense of fulness in the region of the liver antecedent to inflammation, tend to shew that hepatitis is generally preceded by congestion.

52. IF proper methods be taken to relieve this congestion on its first at-

tack, such as diminishing the column of blood, or inducing a determination of it to contiguous parts, the tone of the vessels will be preserved, and actual inflammation prevented. Or even if an obvious inflammation has commenced, the same means will be equally serviceable by allowing the distended vessels to recover that tone which they were beginning to lose. But if the congestion has been of some duration, and the tonic state of the vessels considerably impaired, if the most active means are not employed, the consequence will be either a suppuration, if the inflammation be violent, or a degeneracy into scirrhus, if the inflammation has been moderate: and it is in this way, I conceive, that

an inflammation of the liver, which was of the active kind at its commencement, changes in its progress into a state of scirrhosity.

53. OR, a scirrhous state may be gradually induced on the liver, without any pre-existing active inflammation; as happens after a long residence in a warm climate, where, from frequent accelerated secretion of bile, the hepatic vessels, but more especially the branches of the vena portarum, become so relaxed, that they effuse into the parenchymatous substance of the liver that solid matter, which appears to be nothing more than the coagulable lymph of the blood changed in a peculiar way.*

* DROPSY is a very general consequence of a diseased liver, which, from previous inflammation, may

Admitting this position, it must follow as a consequence, that when the action of the whole exhalant system of the body is increased, the effusion, which is the effect of it, must be as extensive as the cause: and on the contrary, when the accelerated action is confined to a part, the effusion must likewise be

have suffered in its structure in such a way as to produce a considerable impediment to the transmission of blood by the vena portarum.

Such dropsies sometimes first manifest themselves by water in the abdomen, at others by a fluid in the cellular membrane. Now, as both of these originate from the same cause, it may deserve inquiry, to what circumstances we should impute this apparent want of uniformity in nature.

This explanation must be sought for in the laws of the circulation. Whatever share a diminished action of the absorbent system may have in producing an accumulation of watery fluids, it must be evident, that a considerable degree of effusion from the exhalant system is essentially necessary, and which excess of effusion can arise only from an excess of vascular action.

equally limited. Now are there any causes to which we can refer this extensive or limited action? As all accelerated action is to be referred to stimuli of some description, we naturally inquire how that condition of vessels can be produced sometimes in the whole exhalant system, sometimes in a part only.

From established laws in the vascular system, it is clear, that whatever can impede the free passage of the blood from the venous system to the right side of the heart, or from the right side of the heart to the left, will operate as a stimulating cause, and produce effects on the exhalant system, either limited or extensive.

To satisfy ourselves respecting this point, we need only compress a principal vein either of the upper or lower extremity, at the same time allowing the artery to remain free. The effect of this experiment will be, that the veins below the pressed part, immediately become distended, the limb sometime after becomes enlarged, and if pressed upon with the finger, is proved to be evidently in a state of œdema.

Let us inquire what operations have taken place to which we can refer these effects.—It is evident, that the return of venous blood was first impeded by pressure, and that a resistance was formed to the action of the arteries, the ordinary efforts of which are now

become insufficient to propel the blood with its wonted velocity; hence a necessity for greater exertion of the arterial system to surmount the difficulty: but as the exhalants form a part of this system, and partake of the general effect, an effusion of their watery contents follows as a consequence; hence the œdema, or in other words, a local dropfy.

The production of the effect just stated, does not argue or suppose any previous disease either in the exhalants or absorbents, but arises from the concurring operation of two causes, (*viz.*) an impediment to the return of venous blood, and the consequent accelerated action of the capillary and exhalant

systems. And it ought further to be remarked, that as the remote cause was limited to a particular part of the body, so is the effect produced by it.

Let us now transfer this reasoning to the liver, and see how far an impediment to the free passage of blood, through that organ, may operate towards the production of ascites.

That state of the liver, which more particularly disposes to this disease, is the scirrous or indurated one:—that which, when examined by making slices of it, manifests a solid and closely compacted mass, as if there had been deposited interstitially within its substance, solid matter sufficient to destroy its parenchymatous character. Indeed the

fact seems very evident, that its vessels are less pervious, and consequently, that the blood cannot be transmitted by them so freely as in a state of health.

Now in a former part of this work, we endeavoured to make it probable, that the indurated or scirrous condition of the liver depended more on a diseased action of the vena portarum than of the arterial system of this gland; and that when an inflammation arose in this way, it was to be regarded rather as of the passive than of the active kind; or a species but little disposed to terminate in a suppuration. Its effects are rather those that characterize indolent parts, such as induration, scirrhusity, &c. But this consequence necessarily ensues, that

though venous inflammation has not activity enough to produce pus, it has power to effuse the coagulable lymph of the blood into the interstitial parts of the liver, and thereby diminish the capacities of the blood-vessels, more especially of the vena portarum; and thus an impediment to the free passage of blood through that system is formed.

Having thus shown the probability of an obstruction existing to the passage of the blood through the liver, in what manner does this bear a resemblance to the effects of a ligature on the principal vein of an extremity?

Before we can answer this question, we must recall to the attention of our readers what has been said in a former

part of this work on the subject, relative to the circulation of blood through the chylopoietic organs. There it was remarked, that the blood which had circulated through the stomach and intestines, omentum, spleen, and pancreas, and we may likewise add, the peritoneal covering of these viscera, was returned to the heart by the intervention of the vena portarum: therefore it follows, that the circulation of blood through the liver stands in the same relation to the peritoneal viscera, as the returning blood in the principal vein of an extremity does to that particular limb; and likewise it must follow of necessity, that whenever the liver is affected with any considerable degree of scirrhusity,

the circulation through the vena portarum will receive some interruption. That interruption, in whatever degree it may exist, must excite the capillary vessels and exhalants of the peritonæal viscera to greater action; and the effusion of serum or lymph from those parts follows as a consequence. Such appears to me to be a rational explanation of ascites, as founded on a scirrhus affection of the liver.

On the same principle may be explained the hydrothorax, as originating in the excitement of inflammation in the cavity of the chest; or in any mechanical obstacle to the free passage of the blood from one side of the heart to the other, or from the pressure on the

diaphragm arising from an enlarged liver, or an ascitic dropfy. This is the morbid structure of the liver, which generally terminates in ascites.

54. BUT there is an appearance sometimes met with on dissection, that is perhaps a little difficult to explain on this system of reasoning—this is, a tubercular state of the substance of this organ, consisting of a series of circumscribed inflammations, interspersed through the apparent healthy substance of it. Now it may seem a little difficult to understand how an accelerated circulation through the whole substance of the liver can produce effects so partial and circumscribed. But the difficulty is no greater in this case than in

any other of local inflammation. Do we not see, continually, instances of circumscribed inflammations and abscesses, where the state of the circumjacent parts is natural and healthy? Such phænomena do not tend to disprove the principles we wish to establish; but shew, that the diseased condition of vessels we have before pointed at, may exist in a number of small parts of any organ, while the greater part of its bulk shall be in a natural state; or, that there may exist a considerable number of stimulating causes in the substance of the liver, each having its own sphere of action, and each limited in its extent.

55. THE explanation just given is not offered as the mere suggestion of

theory, but admits of a degree of probability approaching to demonstration. This last opinion seems strongly supported by the result of an experiment that was made for the purpose of investigating a point in physiology, not connected with the present question.



EXPERIMENT.

56. Two drachms of crude mercury were injected, by means of a proper apparatus, into the crural vein of a dog. It produced no effects that were obvious for at least a whole day; but afterwards, there were evident marks of in-

creased action in the vascular system, attended with a quick and hard pulse. After he had continued in this state two or three days, a dyspnœa supervened; this was soon followed by a cough, and symptoms evidently denoting an affection of the lungs, which daily increased until he died. His lungs, on examination, were found in a tubercular state; many of these tubercles had suppurated and formed vomicæ.

57. THE question here is, whether these tubercles and vomicæ arose from the introduction of the mercury?

The answer is very clear. The animal was in perfect health before. This, however, is only a presumptive evidence.

But a minute examination of the tubercles, put the matter out of doubt; for on making sections into the substance of them, each contained a globule of mercury, forming a kind of nucleus to the circumscribed inflammation or tubercle. Whether these mercurial globules acted on the principle of simple stimuli, or in a specific way, is not a subject for our present investigation: but the inference intended to be drawn is, that symptoms of general excitement may exist in the whole body, and that only a particular organ may show marks of disease; and further, that the circulation may be accelerated through all the vessels of an organ, while only par-

ticular parts of that organ suffer a visible alteration in their structure.

58. Now it is natural to refer these appearances to some local cause, but which is not always so evident as in the experiment just recited. This cause may consist in local alterations in the tone of the vessels in particular parts of an organ; so that, in consequence of an accelerated circulation through its whole substance, these debilitated parts may readily fall into a state of chronic inflammation.

59. In considering the active and indolent inflammations of the liver, we have referred the former to the hepatic artery or nutrient vessel; while the

latter has been considered as an affection of its secretory vessel. As this opinion is not taken up on the ground of mere conjecture, it will not be out of place here, to assign a reason for having adopted it.

60. WHEN we state that chronic inflammations of the liver appear to be connected with its secretory office, we do not mean to rest the explanation on any thing specific in its secretory energy, but on its peculiarity of having the secretion effected from venous instead of arterial blood.

61. IT is a fact well established in physiology, that the living power or energy of any organ is, *cæteris paribus*, in proportion to the quantity of arterial

blood that circulates through it. There is something then in the condition of arterial blood, that fits an organ, for active and vigorous purposes; the proofs of this position are so numerous, that they must occur to every one. Now when we recollect, that by far the greater portion of blood which passes through the liver is of the venous kind, and when it is remembered likewise, that this is less fitted to active purposes than arterial blood, there will appear sufficient grounds for believing, that chronic inflammations of the liver are to be referred to the vena portarum, while those of the active kind are imputable to the hepatic artery.

62. IN the active and acute inflam-

mation of the liver, as well as that of other organs, the antiphlogistic practice should be adopted ; and as the attention of the practitioner should be directed to the prevention of suppuration, he must be guided by the circumstances of each individual case in forming his judgment to what extent that practice may be pursued. Here much depends on his discernment, as well respecting the extent of the antiphlogistic practice; as in determining the precise period when it is likely to be most useful : for it must be obvious, that if any considerable advantage is to be expected from this practice, it must be looked for in an early stage of the disease, when the in-

flammation has not advanced beyond the probability of resolution.

63. THE more prominent part of the antiphlogistic treatment is blood-letting: the quantity of blood to be taken away, together with the propriety of repeating that operation, can be judged of only by the violence of symptoms, by the effect upon the pulse, and by the circumstances of each individual case.

64. BLISTERS, applied to the region of the liver, co-operate very strongly with the views of blood-letting, and therefore, in attempting resolution, recourse should be had to them very early; and here again the same discrimination is necessary with respect to their dura-

tion and repetition, as was required in the case of blood-letting. It has been advanced by some, and experiment appears to have justified the position, that a quick succession of blisters to the vicinity of an inflamed organ, prevails more over the activity of inflammation, than the long protracted discharges from a single vesication. My own experience having abundantly confirmed the truth of this doctrine, I cannot recommend it to the practitioner in too strong terms.

65. As subservient to the intention of resolution, medicines promoting saline evacuations are highly expedient; for this purpose, those which are of a saline nature appear to me to claim a preference; and perhaps it is adding

not a little to their efficacy, to exhibit them in a diluted form, in which state they not only seem to be more strictly antiphlogistic, but are less liable to occasion nausea, and other disagreeable sensations in the stomach.

66. IN blood-letting, blisters, and laxative medicines, appear to consist the more essential parts of antiphlogistic practice; but there are other resources of which we can avail ourselves, and which, though subordinate in point of activity, are found from practice to be very efficacious as auxiliaries. Under this head we may rank antimonials, exhibited in such doses as may tend to produce and continue a degree of softness and moisture upon the skin; and

this operation of antimonials is much aided by a free and plentiful use of diluting liquors, of which there is an endless variety.

67. BY the means above recited, the practitioner, if called in at the commencement of the disease, will generally be able to check every tendency to the suppurative process.

68. IN warm climates, more especially in the East Indies, where hepatitis may be regarded as the endemia of the country, the tendency to run on into the suppuratory process is so great, as scarcely to be resisted even by the most active practice; therefore, if an early and vigorous pursuit of the antiphlogistic plan of treatment be necessary in this

country, where the course of the disease is comparatively moderate; the extension of such treatment to the utmost limits of prudence, becomes expedient, if we would oppose with success the rapidity of its progress.*

69. IF, either from an unusual violence of the disease, the too late application for medicinal assistance, or the unavailing effects of the antiphlogistic plan of treatment, the inflammation shall have proceeded to the suppurative stage, different phænomena occur, according to the particular part of the liver in which the suppuration is seated.

* See Mr. Christie's Letter to the Author, in the Medical and Physical Journal, vol. 2. p. 4. in which the frequency, violence, and rapidity of the disease among Europeans newly arrived in India, is particularly pointed out.

These phænomena are such as arise out of the laws which regulate the opening of abscesses : for, the operation of nature in this respect, as well as in most others, is regular and uniform.

70. FROM observation we learn, that sometimes hepatic abscesses open spontaneously into the intestinal canal, in the manner explained at some length in a former part of this work ; at others, they make their way through the diaphragm into the air cells of the lungs, from whence the matter is discharged by expectoration ; or, an adhesion takes place between the anterior surface of the liver and the parietes of the abdomen, allowing the pus to make its escape by the common integuments.

71. EACH of these channels of discharge is determined very much by the particular seat of the abscess. When the posterior or concave surface is concerned, the matter usually passes off by some part of the intestinal canal, frequently the duodenum; but when it is seated towards the inferior edge, the colon offers a readier outlet. When the superior portion suppurates, the air cells of the lungs favour the escape; and such abscesses as form towards the anterior surface, usually extend themselves to the integuments, through which they discharge their contents, either spontaneously, or by the aid of surgical means.

72. THE intention of nature in re-

lieving herself by these different channels is the same, as she is guided by one common principle in all of them, viz. that of availing herself of the readiest outlet. But experience has evinced, that these are not all equally favourable to her ultimate views; and some hepatic abscesses, which have been discharged by the lungs, appear to have produced their fatal effects more from an extension of such abscesses into the substance of these organs, than from any derangement the constitution had sustained from the affection of the liver. I feel myself warranted the more in maintaining this idea, not only from having repeatedly seen the symptoms of hepatitis, in its latter stage, evidently

transformed into the characters of peripneumony ; but from having ascertained, by examination after death, that a suppurative surface, which originated in the liver, extended itself into the substance of the lungs in such a degree, as clearly to explain the cause of the peripneumonic symptoms.

73. THE discharge of hepatic abscesses, either by the intestines or the abdominal surface, is much preferable ; as in the former, the organ, though important and even vital, is affected only to a small extent ; and in the latter, very little danger can arise from an opening of a moderate size. What occasions our surprize is, that they seldom effuse their contents into the cavity

of the abdomen. The law itself is wonderful, though the means by which nature carries her intentions into effect are very obvious; for in all these cases the opening is furrounded by adhesions so effectually, that there is little danger of the general cavity being exposed.

74. IF, however, the disease is well marked, and the abscess has pointed to a determined part of the integuments, we need not wait for a spontaneous opening, but by means of a lancet may discharge the matter. Such abscesses are seldom in haste to heal, nor is it desirable, until the cavity of the abscess shall have been filled up by healthy granulations. During this process, which is sometimes tedious, the health

gradually returns ; and I have had experience of cases, where the discharge accompanying this granulating operation was continued for years, during which time the health was in a progressive state of amendment, and at length was perfectly established.

75. SUCH instances, though surprising, are not mysterious, for a part only of the liver has been concerned in the abscess. During the period of active inflammation, the constitution partook of the effects, perhaps, more from a principle of sympathy with the inflamed organ, than from any derangement in its economy as a gland ; and therefore it is natural to expect, that, as the

inflammatory symptoms subsided, the signs of health should return.

76. AN opinion has for some time prevailed, that mercury is a specific in every disease of the liver; and that even in active phlegmonous inflammations it will obviate suppuration. This opinion appears to have been founded on an idea, that there is something very peculiar in the inflammation of the liver that is not met with in any other organ.

77. IT is true, that in considering its glandular office, it affords an exception to the law of glands, in having its secretion performed from venous blood; and this we have already considered as having a connexion with

chronic inflammation, which experience has shown to be relievable by mercury. The success in these cases has perhaps led to an empirical practice, and due discrimination may not always have been made between inflammations of a more indolent, and such as are of a more active nature.

78. To exhibit a remedy without due discrimination is to abuse it, and at length to bring it into neglect; and in this way the world has been deprived, for a time, of the benefit of some of the most valuable articles of the *materia medica*, which, however, have been restored to them afterwards, on the recommendation of men of candour and ability, after having determined their

true value by repeated and judicious exhibition.

79. PERHAPS the same fate may await the use of mercury in complaints of the liver, if, by a blind empirical administration of it, it be incautiously employed in the active periods of inflammation, when, from its stimulant properties, it appears better calculated to accelerate, than to retard the suppurative process.

80. IT is very probable, that the attachment of the practitioners in warm climates to the early use of mercury, may have arisen in part from the great debility consequent on the previous excitement of the system, which debility is supposed to prevail the most, where

there had been much evacuation ; and this prejudice has perhaps been carried to a dangerous extreme. But there are not wanting some, who are perfectly aware of the necessity of proper distinctions, and who pay due regard to them in their practice.

81. IN the East Indies, where this complaint is endemic, I am informed, on the best authority, that many judicious and successful practitioners seldom administer mercury until the violence of the inflammatory action has been moderated by bleeding, active purging, and the antiphlogistic plan of treatment. Then it is, that mercury is employed to the greatest advantage. But it appears on attentive observation, that the

transition of active inflammation into a state of resolution, is not immediately followed by a healthy condition of the part, but it remains for a time debilitated, and disposed to lapse into a chronic state. This will probably be found the proper period for the exhibition of mercury, which acts as a spur on the vascular system of this organ, and by its moderately stimulating effects, occasions a degree of action, which, when protracted to a proper length, terminates in health.*

* The following remarks were communicated by my particular friend, Dr. JAMES CURRY, Physician to GUY'S HOSPITAL, who having been in India in 1786-7, and since that time practised in this country, may be considered as having had a better opportunity of comparing the nature and treatment of the disease, than falls to the lot of many.

82. BUT the disposition of hepatitis to terminate in a scirrhus and diseased structure, either of the whole, or of a

“ The observations in par. 76-81, on the employment of mercury in acute hepatitis, are extremely just, as far as respects its operation on the system at large ; which is the view usually taken of the remedy in hepatic affections whatever their nature may be. But, from the general and comprehensive term *mercury*, an exception must be made in favour of calomel, in acute inflammation of the liver. Indeed when we consider the violence and rapidity of the disorder in many instances, it does not seem possible to excite a general mercurial action, sufficiently soon to overtake and arrest its progress ; and if it were, it would not appear advisable to make the attempt, lest the suddenness and violence of such action might ultimately be productive of greater mischief than would attend the original disease under any other mode of treatment. From this objection, however, calomel is entirely free ; as the good effects from it may be obtained not only more speedily than in the other way, but without occasioning any *general* operation, and, consequently, without that injury which certain constitutions experience from mercury when carried to that degree.

Whether from the greater tone of fibre in temperate and cold, than in hot climates,—from the increased

part of the liver, is so strong in some cases, as not to be resisted by a moderate mercurial action. Here we are to take

action of the liver as a *secretory* organ in these last,—or from both of these circumstances,—certain it is, that hepatitis in Europe partakes much more of the nature of simple inflammation, than hepatitis in India; and of course, the simple antiphlogistic plan of cure will of itself be oftener successful in the former than in the latter variety of the disease. From my own practice, however, in this country, as well as from comparing it with that of others, I am as firmly convinced as I can be of any medical fact, that, by the early and free administration of calomel, I have saved many a pound of blood which must otherwise have been taken away, to alleviate the urgent symptoms of hepatic inflammation. In proof of this I could adduce a great number of cases; but some have occurred to me lately, both in the Hospital and in private practice, which are particularly illustrative of the benefit derived from calomel in all inflammatory affections in which the liver is any wise concerned;—as in the cases alluded to, from the pain being seated in the *left* side of the thorax, and no symptom present which clearly indicated hepatic affection, they were at first considered as peripneumonic or pleuritic, and treated accordingly, by local and general

the advantage of its more active operations ; and, instead of inducing a slight change upon the pulse, with only a

blood-letting, purging with infusion of senna, blisters to the part, and the use of antimonial diaphoretics. Notwithstanding these remedies, however, no considerable or permanent relief was obtained, until their failure led me to suspect, that the *liver* was the primary seat of the complaint, and the remote thoracic pain only symptomatic. Upon this impression, I immediately put in practice the mode which I had before employed with success in obvious cases of hepatic inflammation,—of giving three or four grains of calomel every four or six hours, as the urgency of the symptoms required ;—and with the effect of entirely removing the pain and difficulty of breathing in the course of the night.

As in most other cases, calomel given in such doses and at such intervals proves considerably purgative, it might be concluded, that its good effects here were entirely owing to its cathartic power. This is in a great measure true, but is so only in a particular sense of the term *cathartic*, and therefore requires explanation. The bowels may be repeatedly cleared by other purgatives without much relief ; and even calomel is often attended with little if any more advantage, if it pass very speedily through the intestines. The mode in which alone it

tendernefs of the mouth, we ought to extend its effects to the production of a gentle falivation, which, when continued

proves effectual, is, by emulging the biliary ducts; and the evidenc and meafure of its falutary operation is, the quantity of bile which it evacuates by ftool. Though its effects then, be ultimately that of a cathartic, yet it is not fimplly as fuch that it is ufeful, but by acting fpecifically, and being (if I may be allowed an antiquated expreffion) a *cholagogue*, or evacuant of bile. Why a medicine poffeffing fuch a property fhould be efpecially ferviceable in hepatitis, muft I think be pretty obvious; but if it fhould be thought to require illuftration, we have a very familiar one in the inftance of another glandular organ; I mean the female mamma. Praétitioners have daily opportunity of feeling the immediate and great relief afforded by drawing out the milk where this gland becomes inflamed after lying-in, or during the period of lactation: indeed, in many cafes of inflamed breaft, little elfe is neceffary than emptying the lactefcrous ducts at the beginning, and repeating it from time to time as the milk re-accumulates;—the inflammatory action of the veffels often fubfiding fpontancoufly, when this caufe of diftention and irritation is removed. Though the means employed in hepatitis are neceffarily different, yet the effect is the fame;—the general diftention of the liver

for a length of time, generally effects a cure.

83. IN the exhibition of mercury for

is lessened by emulging it of its bile, which, at the same time that it is secreted in larger quantity from the increased action of the vena portæ, is prevented from passing freely into the duodenum, in consequence of the hepatic and common ducts partaking of the inflammatory state. The general cholagogue power of calomel, is well known to all those who have practised in hot climates, and particularly in India; and it now begins to be admitted by practitioners in this country, who are attentive to its operation. But its having this effect in acute hepatitis, can only depend on its lessening or removing in the first instance, that inflammatory constriction of the ducts which occasions the bile to be retained in the liver; for (as I have already observed) other medicines, the general cathartic effect of which is much greater than calomel, are by no means of equal service. It amounts, I think, to a proof of this opinion, that even calomel fails if it pass through the bowels quickly; and that I have often been obliged to assist its relaxing power on the biliary ducts, by joining it with opium and antimonial powder, especially the former, which I give to the amount of a grain or more every six hours, or as often as the urgency of the pain renders necessary. Under this management, I have

this purpose, a preference has been given to friction ; and the part on which the mercurial ointment has been rubbed, is

repeatedly found the urgent symptoms abate considerably, many hours before any alvine evacuation took place, and of course before the calomel could be said to act as a cathartic : in some cases too, where no evacuation followed, it became necessary to give cathartic medicines afterwards, in order to secure the relief which the calomel had procured, and to prevent the pain and dyspnœa from returning ; which they were apt to do, if the liver was not emptied while under the relaxing influence of the calomel and opium. It not unfrequently happens, that the stomach partakes so much of the inflammatory condition of the liver, and becomes in consequence so extremely irritable, as to reject every thing by vomiting almost as soon as swallowed. In this state of continual retching, which greatly aggravates the disease, and increases the pain almost to agony, the effervescent draughts, and other means usually employed, were of no avail, nay even calomel united with opium, proved too irritating. Under these circumstances, instead of the calomel in its ordinary state, I have with the best effects prescribed calomel, freed from its muriatic acid, by carefully triturating it with lime water ; whereby it is converted into a dark slate-coloured oxyd, virtually the same with the *Hydrargyrus præcipitatus cinereus*

the right hypochondrium, from a notion of its efficacy being greater when applied to the vicinity of the diseased

of the Edin. Pharm. and with that formed in making Plinck's Solution, which you yourself first employed and recommended in this country. It is so much less irritating to the stomach and bowels than calomel, that when joined with opiates, it will be retained with ease; and the effects of it in allaying pain, retching, and other urgent symptoms in hepatic inflammation, have been often not less astonishing to myself, though long in the habit of using it, than to a number of gentlemen who have had an opportunity of investigating a practice which was altogether new to them. This *local* mercurial operation of calomel is not solitary; we have a similar instance of it in the effects which were observed to attend the practice recommended by the late Mr. Clare, for the cure of venereal complaints: by rubbing two or three grains of calomel upon the gums daily, the salivary glands were very quickly affected, and a ptyalism induced; while the system was so little affected, that chancres either remained as before, or if they healed, soon broke out again.

I have had repeated opportunities of knowing that your practice exactly accords with what I have said upon this subject; but I was induced to be more parti-

organ, than to a distant part. But my opinion is, that, except in so far as friction may serve the place of gentle exercise to the part, and thereby assist in emulging the biliary ducts, there is no material advantage derived from this; and that it is of little importance, what part is made choice of, provided the effects produced on the general system are equally strong.

84. THE knowledge we derive from anatomy, respecting the structure, origin, and direction of the lymphatic vessels, sufficiently proves, that neither by the internal use of mercury, nor by

cular in my detail, lest those who have not had such advantage, might misapprehend what you have said respecting the use of mercury; and apply to *calomel* what was only meant with regard to mercury when employed so as to operate on the system at large."

its external application, can any of it be made to pass through the liver in its way into the constitution; it cannot, therefore, act on the liver, but by being first introduced into the blood-vessels. It is sometimes difficult in cases of diseased liver, especially if attended with dropsy, to introduce mercury into the constitution; under such circumstances, the best absorbing surface should be employed for the purpose of friction; such parts of the body as have the finest cuticle, as between the fingers, in the axilla, or groin, absorb most readily, and if the cuticle be removed by blisters, from any part of the body, such a surface will be found best adapted to the purpose of absorption. Ulcers fre-

quently absorb better than entire surfaces, and in many cases such artificial means of promoting absorption may be admitted.—It is likewise a subject worth considering, whether still greater advantage may not be derived from the introduction of the more active chemical preparations of mercury by absorption, than by the use of the common mercurial ointment.—Ulcerated surfaces will absorb the saline preparations of mercury, while a surface covered with a cuticle, would with difficulty admit them. The quantity of mercury at any one time in a state of action in the body, is so small, as to elude all the powers of chemical inquiry. In repeated trials with the most accurate tests

of various kinds, I have not been able to discover the least trace of mercury in the secretions of persons under salivation, either from the internal or external use of it.

85. THE scirrhusity, which we have been considering as the remains of hepatitis, is often very intimately connected with other diseases; and is thought, by men of observation and experience, to stand in relation to them as a cause. Thus in India, the fever and dysentery, which are considered as the endemiæ of the country, have been found on dissection, to be accompanied with diseases of the liver. In some instances, the whole substance has been in a scirrhusous state; in others, abscesses and the usual

appearances of hepatitis have been met with: the fact is certain, though the relation in which they are placed to each other may be matter of opinion.

86. IF it be true, (and there can be but little room for doubt), that every disease of a gland must affect, in some degree or other, its secretory powers, we may admit, that the biliary secretion may become extremely vitiated, may acquire acrid properties, and may morbidly affect the intestinal canal by its passage through it; hence may follow ulcerations of the internal surface, giving rise to the common symptoms of dysentery. But if it be an established fact, as has been asserted by high authority, that the dysentery is always contagious,

there would seem to be a necessity for calling in some other principle of action, in addition to the acrimony of the bile. But waving this controversy, which cannot be protracted to a greater length, without evidently digressing from the main purpose of this chapter, it is in place here to observe, that these dysenteries are so far congenial to the hepatic affections with which they are combined, that they are generally relieved by mercury, administered under the cautions we have already laid down.

F I N I S.

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Published by *Samuel Curtis*, Florist Walworth.





